

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

1) Convert  $327^\circ$  to radian measure.

A)  $\frac{109\pi}{120}$

B)  $\frac{109}{120}$

C)  $\frac{109}{60}$

D)  $\frac{109\pi}{60}$

1) \_\_\_\_\_

2) Convert  $-150^\circ$  to radian measure.

A)  $-\frac{5}{3}\pi$

B)  $\frac{7}{6}$

C)  $-\frac{5}{6}\pi$

D)  $\frac{5}{3}$

E) none of these

2) \_\_\_\_\_

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

Convert the given angle measure to radians. Give an exact answer.

3)  $10^\circ$

3) \_\_\_\_\_

4)  $6^\circ$

4) \_\_\_\_\_

5)  $-55^\circ$

5) \_\_\_\_\_

6)  $760^\circ$

6) \_\_\_\_\_

7)  $15^\circ$

7) \_\_\_\_\_

8)  $-210^\circ$

8) \_\_\_\_\_

9)  $780^\circ$

9) \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

Convert the angle from degrees to radians. Express the answer as a multiple of  $\pi$ .

10)  $30^\circ$  10) \_\_\_\_\_  
A)  $\frac{\pi}{7}$  B)  $\frac{\pi}{8}$  C)  $\frac{\pi}{6}$  D)  $\frac{\pi}{5}$

11)  $-30^\circ$  11) \_\_\_\_\_  
A)  $-\frac{\pi}{8}$  B)  $-\frac{\pi}{6}$  C)  $-\frac{\pi}{5}$  D)  $-\frac{\pi}{7}$

12)  $330^\circ$  12) \_\_\_\_\_  
A)  $\frac{11\pi}{5}$  B)  $\frac{11\pi}{6}$  C)  $\frac{11\pi}{3}$  D)  $\frac{11\pi}{12}$

13)  $144^\circ$  13) \_\_\_\_\_  
A)  $\frac{8\pi}{5}$  B)  $\frac{2\pi}{5}$  C)  $\frac{3\pi}{5}$  D)  $\frac{4\pi}{5}$

14)  $530^\circ$  14) \_\_\_\_\_  
A)  $\frac{17\pi}{18}$  B)  $\frac{53\pi}{18}$  C)  $\frac{53\pi}{36}$  D)  $\frac{53\pi}{9}$

15)  $810^\circ$  15) \_\_\_\_\_  
A)  $-\frac{9\pi}{2}$  B)  $9\pi$  C)  $-\frac{9\pi}{4}$  D)  $\frac{9\pi}{2}$

16)  $-270^\circ$  16) \_\_\_\_\_  
A)  $\frac{3\pi}{2}$  B)  $-\frac{3\pi}{4}$  C)  $-3\pi$  D)  $-\frac{3\pi}{2}$

17)  $1080^\circ$  17) \_\_\_\_\_  
A)  $\frac{13\pi}{2}$  B)  $6\pi$  C)  $\frac{11\pi}{2}$  D)  $12\pi$

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

Convert the given angle to degree measure.

18)  $\frac{2\pi}{3}$  18) \_\_\_\_\_

19)  $-\frac{3\pi}{15}$  19) \_\_\_\_\_

20)  $\frac{29\pi}{6}$

20) \_\_\_\_\_

21)  $\frac{9\pi}{2}$

21) \_\_\_\_\_

22)  $\frac{2\pi}{5}$

22) \_\_\_\_\_

23)  $-3\pi$

23) \_\_\_\_\_

24) Does this represent an angle of  $-\frac{3\pi}{4}$  radians?

24) \_\_\_\_\_



Enter "yes" or "no".

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

25) Which of the following statements is false?

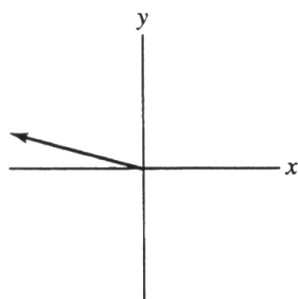
25) \_\_\_\_\_

A) The degree measure of  $\theta = \frac{13\pi}{6}$  is  $390^\circ$ .B) The degree measure of  $\theta = -\frac{5\pi}{4}$  is  $135^\circ$ .C) The terminal side of the angle  $\theta = \frac{13\pi}{6}$  lies in the first quadrant.D) The terminal side of the angle  $\theta = -\frac{3\pi}{4}$  lies in the fourth quadrant.

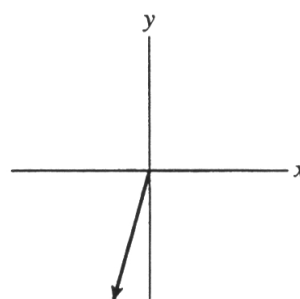
26) Which of the following angles could represent the angle  $-\frac{17\pi}{12}$ ?

26) \_\_\_\_\_

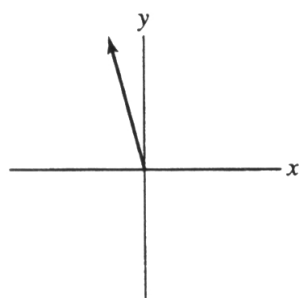
A)



B)



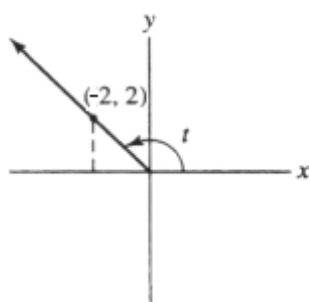
C)



D) none of these

27) Give the value of  $\sin t$  where  $t$  is the radian measure of the angle shown.

27) \_\_\_\_\_



A)  $-\frac{2}{2} = -1$

B)  $-2$

C)  $2$

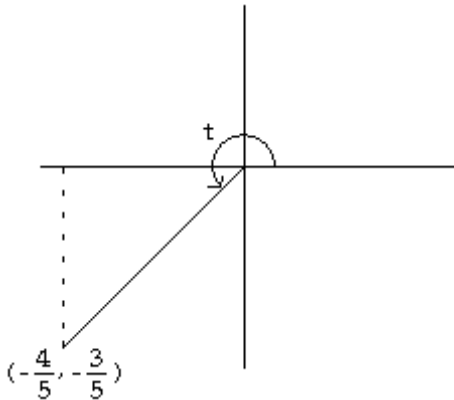
D)  $\frac{2}{\sqrt{8}} = \frac{\sqrt{2}}{2}$

E) none of these

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 28) Give the values of  $\sin t$  and  $\cos t$ , where  $t$  is the radian measure of the angle shown.

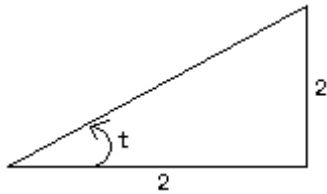
28) \_\_\_\_\_



Enter your answer as a, b (unlabeled) where a represents  $\sin t$  and b represents  $\cos t$ .

- 29) Give the values of  $\sin t$  and  $\cos t$ , where  $t$  is the radian measure of the angle shown.

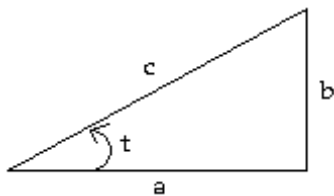
29) \_\_\_\_\_



Enter your answer as a, b (unlabeled) where a represents  $\sin t$  and b represents  $\cos t$ .

- 30) Refer to the triangle whose sides and angles are labeled below. Estimate  $t$  if  $a = 24$ ,  $b = 10$ , and  $c = 26$ .

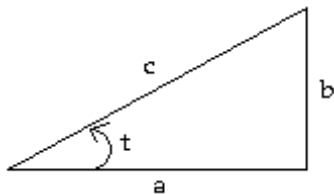
30) \_\_\_\_\_



Enter just a real number rounded to one decimal place.

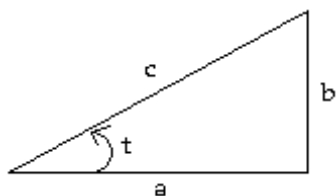
- 31) Refer to the triangle whose sides and angles are labeled below. If  $t = 0.5$  and  $a = 5$ , find  $c$ .

31) \_\_\_\_\_



Enter just a real number rounded to one decimal place (unlabeled).

- 32) Refer to the triangle whose sides and angles are labeled below. If  $t = 0.6$  and  $a = 4.1$ , find  $b$ . 32) \_\_\_\_\_

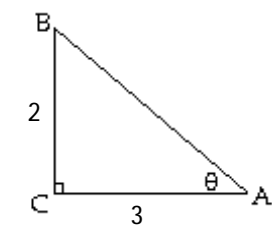


Enter just a real number rounded to one decimal place (unlabeled).

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

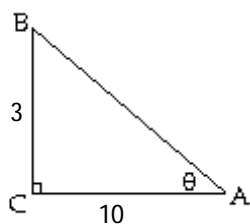
Find the indicated trigonometric function, where  $\theta$  is the radian measure of the given angle. Give an exact answer with a rational denominator.

- 33) Find  $\sin \theta$ . 33) \_\_\_\_\_



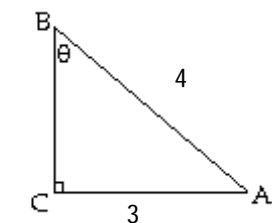
- A)  $\frac{\sqrt{13}}{2}$       B)  $\frac{2\sqrt{13}}{13}$       C)  $\frac{3\sqrt{13}}{13}$       D)  $\frac{\sqrt{13}}{3}$

- 34) Find  $\cos \theta$ . 34) \_\_\_\_\_



- A)  $\frac{10\sqrt{109}}{109}$       B)  $\frac{\sqrt{109}}{3}$       C)  $\frac{3\sqrt{109}}{109}$       D)  $\frac{\sqrt{109}}{10}$

- 35) Find  $\sin \theta$ . 35) \_\_\_\_\_



- A)  $\frac{\sqrt{7}}{4}$       B)  $\frac{4\sqrt{7}}{7}$       C)  $\frac{3\sqrt{7}}{7}$       D)  $\frac{3}{4}$

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

36) Find  $t$  such that  $0 \leq t \leq \pi$  and  $\cos t = \cos\left(-\frac{2\pi}{3}\right)$ . 36) \_\_\_\_\_

Enter just a reduced quotient of form  $\frac{a}{b}$  with  $\pi$  in the numerator (unlabeled).

37) Find  $t$  such that  $0 \leq t \leq \pi$  and  $\cos t = \cos\left(-\frac{7\pi}{6}\right)$ . 37) \_\_\_\_\_

Enter just a reduced quotient of form  $\frac{a}{b}$  with  $\pi$  in the numerator (unlabeled).

38) Find  $t$  such that  $-\frac{\pi}{2} \leq t \leq \frac{\pi}{2}$  and  $\sin t = \sin\left(\frac{10\pi}{3}\right)$ . 38) \_\_\_\_\_

Enter just a reduced quotient of form  $\frac{a}{b}$  with  $\pi$  in the numerator (unlabeled).

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

39) Find the  $t$  such that  $0 \leq t \leq \pi$  and  $\cos t = \cos\left(-\frac{2\pi}{3}\right)$ . 39) \_\_\_\_\_

A)  $-\frac{\pi}{3}$

B)  $\frac{\pi}{3}$

C)  $\frac{2\pi}{3}$

D)  $\frac{\pi}{6}$

E) none of these

40) Find  $t$  such that  $-\frac{\pi}{2} \leq t \leq \frac{\pi}{2}$  and  $\sin t = \sin\left(\frac{3\pi}{4}\right)$ . 40) \_\_\_\_\_

A)  $-\frac{\pi}{3}$

B)  $\frac{\pi}{4}$

C)  $\frac{\pi}{6}$

D)  $\frac{\pi}{2}$

E) none of these

41) Find  $t$  such that  $0 \leq t \leq \frac{\pi}{2}$  and  $\sin t = \cos t$ .

41) \_\_\_\_\_

- A) 0
- B)  $\frac{\pi}{4}$
- C)  $\frac{\pi}{8}$
- D)  $\frac{\pi}{3}$
- E) none of these

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

42) Determine the value of  $\sin t$  and  $\cos t$  when  $t = 3\pi$ .

42) \_\_\_\_\_

Enter your answer as just a, b where a represents  $\sin t$  and b represents  $\cos t$  (no labels)

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

43) Determine the value of  $\cos t$  when  $t = -7\pi$ .

43) \_\_\_\_\_

- A)  $\frac{\sqrt{2}}{2}$
- B) 1
- C) -1
- D) -2
- E) none of these

44) Determine the value of  $\sin t$  when  $t = \frac{11\pi}{2}$ .

44) \_\_\_\_\_

- A)  $\frac{1}{2}$
- B) 1
- C) 0
- D) -1
- E) none of these



45) Suppose  $\sin t = -\frac{5}{13}$  and  $\cos t$  is negative. What is  $\cos t$ ?

45) \_\_\_\_\_

A)  $-\frac{12}{13}$

B)  $-\frac{8}{13}$

C)  $\frac{11}{13}$

D)  $-\frac{18}{13}$

E) none of these

Use the properties of the sine and cosine to solve the problem.

46) Assume  $\sin(0.47) = 0.45$

46) \_\_\_\_\_

Find  $\cos(0.47)$ ,  $\sin(-0.47)$ , and  $\cos\left(\frac{\pi}{2} - 0.47\right)$ .

A)  $\cos(0.47) = -0.89$   
 $\sin(-0.47) = 0.45$   
 $\cos\left(\frac{\pi}{2} - 0.47\right) = 0.45$

B)  $\cos(0.47) = 0.89$   
 $\sin(-0.47) = -0.45$   
 $\cos\left(\frac{\pi}{2} - 0.47\right) = 0.45$

C)  $\cos(0.47) = 0.89$   
 $\sin(-0.47) = 0.45$   
 $\cos\left(\frac{\pi}{2} - 0.47\right) = -0.45$

D)  $\cos(0.47) = 0.55$   
 $\sin(-0.47) = -0.45$   
 $\cos\left(\frac{\pi}{2} - 0.47\right) = 0.89$

47) Assume  $\cos(0.67) = 0.78$

47) \_\_\_\_\_

Find  $\sin(0.67)$ ,  $\cos(-0.67)$ , and  $\cos(0.67 - 8\pi)$ .

A)  $\sin(0.67) = 0.63$   
 $\cos(-0.67) = -0.78$   
 $\cos(0.67 - 8\pi) = -0.78$

B)  $\sin(0.67) = -0.63$   
 $\cos(-0.67) = 0.22$   
 $\cos(0.67 - 8\pi) = 0.78$

C)  $\sin(0.67) = 0.22$   
 $\cos(-0.67) = -0.78$   
 $\cos(0.67 - 8\pi) = -0.78$

D)  $\sin(0.67) = 0.63$   
 $\cos(-0.67) = 0.78$   
 $\cos(0.67 - 8\pi) = 0.78$

Find the derivative of the function.

48)  $y = 8 \cos 10x$

48) \_\_\_\_\_

A)  $\frac{dy}{dx} = 80 \sin 10x$

B)  $\frac{dy}{dx} = -80 \sin 10x$

C)  $\frac{dy}{dx} = 10 \sin 10x$

D)  $\frac{dy}{dx} = -8 \sin 10x$

49)  $y = 5 \sin (5x - 5)$

49) \_\_\_\_\_

A)  $\frac{dy}{dx} = 5 \cos (5x - 5)$

B)  $\frac{dy}{dx} = -5 \cos (5x - 5)$

C)  $\frac{dy}{dx} = 5 \sin (5x - 5)$

D)  $\frac{dy}{dx} = 25 \cos (5x - 5)$

50)  $y = \sin 9x$  50) \_\_\_\_\_  
 A)  $\frac{dy}{dx} = 9 \cos 9x$  B)  $\frac{dy}{dx} = \cos x$  C)  $\frac{dy}{dx} = \cos 9x$  D)  $\frac{dy}{dx} = 9 \cos x$

51)  $y = 6 \sin x^3$  51) \_\_\_\_\_  
 A)  $\frac{dy}{dx} = 18x^2 \cos x^3$  B)  $\frac{dy}{dx} = 18x^2 \cos x^2$   
 C)  $\frac{dy}{dx} = 18x^3 \cos x^3$  D)  $\frac{dy}{dx} = x \cos x^3$

52)  $y = \cos x^4$  52) \_\_\_\_\_  
 A)  $\frac{dy}{dx} = 4 \sin x^4$  B)  $\frac{dy}{dx} = -4x^3 \sin x^4$   
 C)  $\frac{dy}{dx} = -4x^4 \sin x^4$  D)  $\frac{dy}{dx} = \sin x^4$

53)  $y = \cos (8x^2 + 8)$  53) \_\_\_\_\_  
 A)  $\frac{dy}{dx} = 16x \sin (8x^2 + 8)$  B)  $\frac{dy}{dx} = -16x \sin (8x^2 + 8)$   
 C)  $\frac{dy}{dx} = -16 \sin 8x^2$  D)  $\frac{dy}{dx} = \sin (8x^2 + 8)$

54)  $y = 2 \sin 2x \cos x$  54) \_\_\_\_\_  
 A)  $\frac{dy}{dx} = -2 \sin 2x \sin x + 4 \cos x \cos 2x$  B)  $\frac{dy}{dx} = -2 \sin 2x \sin x + \cos x \cos 2x$   
 C)  $\frac{dy}{dx} = 2 \sin 2x \sin x + 4 \cos x \cos 2x$  D)  $\frac{dy}{dx} = \sin 2x \sin x + 4 \cos x \cos 2x$

55)  $y = \cos e^{-5x}$  55) \_\_\_\_\_  
 A)  $\frac{dy}{dx} = 5 \sin e^{-5x}$  B)  $\frac{dy}{dx} = -5e^{-5x} \sin e^{-5x}$   
 C)  $\frac{dy}{dx} = e^{-5x} \cos e^{-5x}$  D)  $\frac{dy}{dx} = 5e^{-5x} \sin e^{-5x}$

Differentiate.

56)  $(\sin x)^7$  56) \_\_\_\_\_  
 A)  $7(\cos x)^6$  B)  $7(\sin x)^6 \cos x$  C)  $7(\cos x)^6 \sin x$  D)  $7(\sin x)^6$

57)  $\sin x^5$  57) \_\_\_\_\_  
 A)  $5 \sin x^4$  B)  $5(\sin x)^4 \cos x$  C)  $5x \cos x^5$  D)  $5x^4 \cos x^5$

58)  $\sin \sqrt{x^4 - 1}$

58) \_\_\_\_\_

A)  $\frac{1}{2} \sin \frac{1}{\sqrt{x^4 - 1}}$

B)  $\cos \sqrt{x^4 - 1}$

C)  $\frac{2x^3 \cos \sqrt{x^4 - 1}}{\sqrt{x^4 - 1}}$

D)  $4x^3 \sin \frac{1}{\sqrt{x^4 - 1}}$

59)  $e^{x^3} \sin x^3$

59) \_\_\_\_\_

A)  $3x(e^{x^3} + \cos x^3)$

B)  $3x^2 e^{x^3} (\sin x^3 + \cos x^3)$

C)  $3x^2(e^{x^3} + \cos x^3)$

D)  $e^{x^3} (\sin x^3 + \cos x^3)$

60)  $(\sin 3t)^2$

60) \_\_\_\_\_

A)  $6 \sin 3t$

B)  $2 \sin 3t$

C)  $2 \sin 3t \cos 3t$

D)  $6 \sin 3t \cos 3t$

E) none of these

61)  $\frac{\sin x}{\cos x}$

61) \_\_\_\_\_

A)  $\frac{\sin^2 x}{\cos^2 x}$

B)  $\frac{1}{\cos^2 x}$

C) 1

D)  $-\frac{\cos x}{\sin x}$

62)  $\frac{\sin x}{x}$

62) \_\_\_\_\_

A)  $\cos x$

B)  $\frac{1}{x} \cos x - \frac{1}{x^2} \sin x$

C)  $\frac{\cos x}{x}$

D) none of these

63)  $\cos 2t \cos 3t$

63) \_\_\_\_\_

A)  $2 \sin 2t \cos 3t + 3 \cos 2t \sin 3t$

B)  $-\sin 2t \cos 3t - \cos 2t \sin 3t$

C)  $-2 \sin 2t \cos 3t - 3 \cos 2t \sin 3t$

D) none of these

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

64)  $x \sin x$

64) \_\_\_\_\_

65)  $\cos^2 x \sin^3 x$

65) \_\_\_\_\_

Enter cosine before sine in all terms, no parentheses around the arguments.

- 66)  $\sin x \cos 3x$  Enter cosine terms first, no parentheses around arguments. 66) \_\_\_\_\_
- 67)  $\sin x^2$  Do not enter parentheses around arguments. 67) \_\_\_\_\_
- 68)  $3 \cos x \sin 2x$  Enter cosine terms first, no parentheses around arguments. 68) \_\_\_\_\_
- 69)  $\cos^2(x + 4)$  Enter cosines before sines with parentheses around arguments. 69) \_\_\_\_\_
- 70)  $\sin^3(x^3)$  Enter sine terms before cosine terms with parentheses around arguments. 70) \_\_\_\_\_
- 71)  $\sin 3x$  No parentheses around arguments. 71) \_\_\_\_\_
- 72)  $\sin 3x^2$  Do not enter parentheses around arguments. 72) \_\_\_\_\_
- 73)  $2 \cos^2(4t)$  Enter cosine terms before sine terms, no parentheses around arguments. 73) \_\_\_\_\_
- 74)  $\ln(\sin 3t)$  Enter a quotient in terms of cosine and sine, no parentheses around arguments. 74) \_\_\_\_\_
- 75)  $e^{\sin(\cos t)}$  Enter cosine before sine (except in the given exponential) and use parentheses around arguments. 75) \_\_\_\_\_
- 76)  $6x \cos^2(\sin x)$  Enter cosines before sines in terms using parentheses around arguments. 76) \_\_\_\_\_
- 77)  $\sin^3(3t)$  Enter sines before cosines with parentheses around arguments. 77) \_\_\_\_\_
- 78)  $\cos(\cos x)$  Enter sines before cosines with parentheses around arguments and a multiplication dot between the first two terms. 78) \_\_\_\_\_
- 79)  $\frac{\cos x}{\sin x - 2}$  Enter a quotient of sine functions without parentheses around the arguments of sine. 79) \_\_\_\_\_

80)  $e^{x^3} \sin x^3$

80) \_\_\_\_\_

Enter your answer in the form  $P(x)e^{Q(x)}(\sin R(x) \pm \cos S(x))$  where P, Q, R, S are polynomials in x in standard form. No parentheses around the arguments of sine and cosine.

81)  $\ln(1 + \sin x)$

81) \_\_\_\_\_

Enter a quotient of sine and cosine functions without parentheses around their arguments.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

82) Find the equation of the line tangent to the graph of  $y = \sin 2x$  at  $x = \frac{\pi}{2}$ ?

82) \_\_\_\_\_

A)  $y - 1 = x - \frac{\pi}{2}$

B)  $y = -2x - \pi$

C)  $y = (\cos 2x) \left( x - \frac{\pi}{2} \right)$

D)  $y = - \left( x - \frac{\pi}{2} \right)$

E) none of these

83) Find the tangent line to the graph of  $f(x) = \cos^2 2x$  at  $\left( \frac{\pi}{2}, 1 \right)$ .

83) \_\_\_\_\_

A) -2

B) 1

C) -1

D) 2

E) none of these

84) Find the tangent line to the graph of  $f(x) = \sin x + \cos x$  at  $(\pi, -1)$ .

84) \_\_\_\_\_

A)  $y = -x + \pi - 1$

B)  $y = -x + 1$

C)  $y = x + \pi$

D)  $y = \pi$

E) none of these

- 85) Find the tangent line to the graph of  $f(x) = (1 + \sin x)^3$  at  $\left(\frac{\pi}{2}, 8\right)$ . 85) \_\_\_\_\_
- A)  $y = 8$   
 B)  $y = -8$   
 C)  $y = \frac{\pi}{2}x - 8$   
 D)  $y = x - 8$   
 E) none of these
- 86) Find the slope of the line tangent to the graph of  $y = \sin\left(\frac{\pi}{2} - x\right) - \cos x$  at  $x = \frac{\pi}{4}$ . 86) \_\_\_\_\_
- A)  $\frac{\sqrt{2}}{2}$                       B)  $\frac{1}{2}$                       C)  $\sqrt{2}$                       D) 0

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 87) Find the equation of the tangent line tangent to the graph of  $y = \cos 3x + 2 \sin x$  at  $x = \frac{\pi}{2}$ . 87) \_\_\_\_\_  
 Enter your answer in standard point-slope form.
- 88) Find the slope of the line tangent to the graph of  $y = \sin 2t$  at  $t = \frac{\pi}{3}$ . 88) \_\_\_\_\_  
 Enter just an integer.
- 89) Find the slope of the line tangent to the graph of  $y = \cos^2 4t$  at  $t = \frac{\pi}{3}$ . 89) \_\_\_\_\_  
 Enter just  $a\sqrt{b}$ .
- 90) Find the slope of the tangent line to the graph of  $y = e^{3x} \cos x^3$  at the origin. 90) \_\_\_\_\_  
 Enter just an integer.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

Find the slope of the line tangent to the curve at the given point.

- 91)  $y = 9 \sin x$ ;  $x = \frac{\pi}{3}$  91) \_\_\_\_\_
- A)  $\frac{9\sqrt{3}}{2}$                       B)  $-\frac{9}{2}$                       C)  $\frac{9}{2}$                       D)  $\frac{1}{2}$
- 92)  $y = 3 \cos x$ ;  $x = \frac{\pi}{4}$  92) \_\_\_\_\_
- A)  $-\frac{3}{2}$                       B)  $\frac{3\sqrt{3}}{2}$                       C)  $\frac{3\sqrt{2}}{2}$                       D)  $-\frac{3\sqrt{2}}{2}$

93)  $y = 9 \sin x$ ;  $x = \frac{\pi}{2}$

93) \_\_\_\_\_

A) 0

B) -9

C)  $\frac{9}{2}$

D) 9

Find the indefinite integral.

94)  $\int 3 \sin 4x \, dx$

94) \_\_\_\_\_

A)  $-\frac{3}{4} \cos 4x + C$

B)  $-12 \cos 4x + C$

C)  $\frac{3}{4} \cos 4x + C$

D)  $3 \cos 4x + C$

95)  $\int (-6 \sin t + \cos 4t) \, dt$

95) \_\_\_\_\_

A)  $6 \cos t + \frac{1}{4} \sin 4t + C$

B)  $-6 \cos t - 4 \sin 4t + C$

C)  $6 \cos t + 4 \sin 4t + C$

D)  $6 \cos t - \frac{1}{4} \sin 4t + C$

96)  $\int \sin 2t \, dt$

96) \_\_\_\_\_

A)  $-\frac{1}{2} \cos 2t + C$

B)  $-2 \cos 2t + C$

C)  $-\cos t + C$

D)  $-\frac{1}{2} \cos t + C$

97)  $\int 3 \sin(t - \pi) \, dt$

97) \_\_\_\_\_

A)  $-3 \cos t + C$

B)  $-3 \cos(t - \pi) + C$

C)  $3\pi \cos(t - \pi) + C$

D)  $3 \cos(t - \pi) + C$

E) none of these

98)  $\int \cos(2x + 1) \, dx$

98) \_\_\_\_\_

A)  $\sin(2x + 1) + C$

B)  $\frac{1}{2} \sin(2x + 1) + C$

C)  $-\cos(2x + 1) + C$

D)  $2 \cos(2x + 1) + C$

E) none of these

99)  $\int \cos(\pi - 3x) dx$  99) \_\_\_\_\_

A)  $\frac{1}{3} \sin(\pi - 3x) + C$

B)  $-\sin(\pi - 3x) + C$

C)  $3 \cos(\pi - 3x) + C$

D)  $-\frac{1}{3} \sin(\pi - 3x) + C$

E) none of these

100)  $\int (\sin x + \cos x) dx$  100) \_\_\_\_\_

A)  $\cos x - \sin x + C$

B)  $2\cos x + C$

C)  $\sin x - \cos x + C$

D)  $2\sin x + C$

E) none of these

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

101)  $\int \cos 7x dx$  101) \_\_\_\_\_

Enter your answer without parentheses.

102)  $\int \sin t \cos t dt$  102) \_\_\_\_\_

Enter your answer in terms of cosine without using parentheses.

103)  $\int \sin(3t + 2) dt$  103) \_\_\_\_\_

Enter your answer using parentheses around the argument of the function.

104)  $\int \sin 4t dt$  104) \_\_\_\_\_

Enter your answer without parentheses around the argument of the function.

105)  $\int 3 \cos(2x) dx$  105) \_\_\_\_\_

Enter your answer using parentheses around the argument of the function.

106)  $\int \cos 2t dt$  106) \_\_\_\_\_

Enter your answer without parentheses.



107)  $\int 4 \sin 2t \, dt$

Enter your answer without parentheses.

107) \_\_\_\_\_

108) Evaluate:  $\int_0^{\pi/2} \sin x \, dx$

Enter just an integer.

108) \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

109) Find the area under the curve  $y = \sin 2x$  from  $x = 0$  to  $x = \frac{\pi}{4}$ .

109) \_\_\_\_\_

- A) 0
- B)  $\frac{4\pi}{3}$
- C)  $\frac{1}{2}$
- D) -1
- E) none of these

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

110) Find the area under the curve  $y = \sin(3t - \pi)$  for  $\frac{\pi}{3} \leq t \leq \frac{2\pi}{3}$ .

110) \_\_\_\_\_

Enter just a reduced fraction.

111) Find the area under the curve  $y = \sin 2x + \cos x$  for  $0 \leq x \leq \frac{\pi}{4}$ .

111) \_\_\_\_\_

Enter as  $\frac{\sqrt{a} + b}{2}$ .

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 112) A department store has revenue from the sale of electrical kitchen appliances that is given approximately by  $R(t) = 2.2 + 2.2 \cos \frac{\pi t}{23}$  for  $0 \leq t \leq 52$ , where  $R(t)$  is revenue in hundreds of dollars for a week of sales  $t$  weeks after January 1. What is the total revenue (to the nearest hundred dollars) earned from  $t = 10$  to  $t = 16$ ?

112) \_\_\_\_\_

- A) \$1100
- B) \$300
- C) \$1000
- D) \$1300

- 113) In a large city, the amount of sulfur dioxide pollutant released into the atmosphere due to the burning of coal and oil for heating purposes is given approximately by  $P(t) = 3 + \cos \frac{\pi t}{26}$  for  $0 \leq t \leq 104$ , where  $P(t)$  is the amount of sulfur dioxide in tons released during the  $n$ th week after January 1. How many tons (to the nearest ton) of pollutants were emitted into the atmosphere from  $t = 0$  to  $t = 65$ ? 113) \_\_\_\_\_
- A) 221 tons                      B) 4 tons                      C) 203 tons                      D) 196 tons

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 114) The U.S. Geological Survey estimates that the normal stream flow of the Potomac River (in millions of gallons per day) is given by the function  $f(t) = 4200 + 3000 \cos\left(\frac{\pi}{6}t + \frac{5\pi}{12}\right)$  where  $t$  denotes the number of months after January 1. Determine the maximum and minimum daily stream flows of the Potomac River. Enter your answer exactly as  $a, b$  where  $a$  represents the maximum and  $b$  represents the minimum, both integers separated by a comma, no units or words. 114) \_\_\_\_\_
- 115) The size of an animal population at time  $t$  is given by  $N(t) = 50,000 + 200 \sin \frac{7\pi t}{48}$ , where  $t$  is the number of months from June 1, 1980. At what rate is the animal population changing on June 1, 1981? 115) \_\_\_\_\_
- Enter your answer as a quotient reduced form  $\frac{a}{b}$  with  $\pi$  in the numerator (no units).
- 116) A person's blood pressure  $P$  at time  $t$  is given by  $P(t) = 90 + 30 \sin \frac{7\pi t}{3}$ , where  $t$  is measured in seconds. What is the average blood pressure over a time interval of 60 seconds? 116) \_\_\_\_\_
- Enter just an integer (no units).
- 117) Suppose in a study of a prairie dog town it is discovered that the number of prairie dogs at any time  $t$  is given by  $P(t) = 1000 + 500 \cos\left(\frac{2\pi t}{12}\right)$ , where  $t$  is measured in months from July 1, 1990. What is the average number of prairie dogs living in the town from July 1, 1990 to July 1, 1992? 117) \_\_\_\_\_
- Enter just an integer.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

Solve the problem.

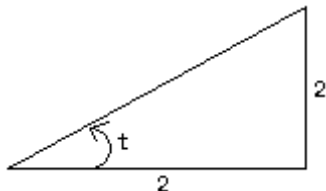
- 118) The velocity of a car is  $63 \cos t$  km/hr on the time interval  $[0, 2]$  hours. Calculate the distance the car traveled in that time interval. 118) \_\_\_\_\_
- A) 183.286 kilometers                      B) 68.714 kilometers  
C) 126 kilometers                      D) 57.286 kilometers

- 119) The motion of a spring-mass system is described by the equation  $y = 11 \sin \left( \pi t - \frac{\pi}{4} \right)$ , where  $y$  is the distance in feet from the equilibrium position and  $t$  is time in seconds. Find the velocity of the mass at time  $t = 3/4$  seconds. Is the mass moving toward or away from its equilibrium position or neither? 119) \_\_\_\_\_
- A)  $11\pi$  feet/second; away from equilibrium position  
 B)  $-11\pi$  feet/second; toward from equilibrium position  
 C) 0 feet/second; away from equilibrium position  
 D) 0 feet/second; neither

- 120) Suppose  $\frac{\pi}{4} \leq x \leq \frac{3\pi}{4}$ . Which of the following statements can be made about  $\tan x$ ? 120) \_\_\_\_\_
- A)  $\tan x$  is not defined.  
 B)  $\tan x$  is positive.  
 C) If  $\tan x$  is defined, then  $|\tan x| \geq 1$ .  
 D)  $\tan x$  is defined.  
 E) none of these

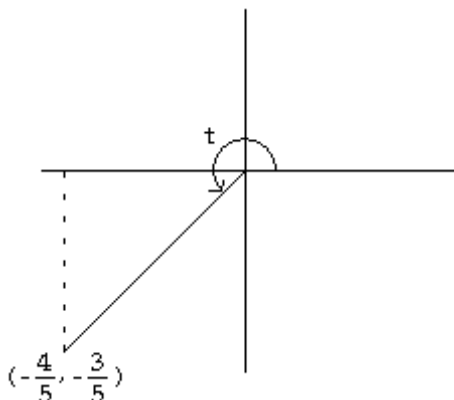
**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 121) Give the values of  $\tan t$  and  $\sec t$ , where  $t$  is the radian measure of the angle shown. 121) \_\_\_\_\_



Enter just a, b where a represents  $\tan t$  and b represents  $\sec t$ . (no labels and no approximations).

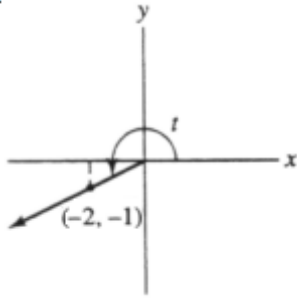
- 122) Give the values of  $\tan t$  and  $\sec t$ , where  $t$  is the radian measure of the angle shown. 122) \_\_\_\_\_



Enter just a, b where a represents  $\tan t$  and b represents  $\sec t$  with any fractions reduced of form  $\frac{c}{d}$  (no labels and no approximations).

123) Give the values of  $\tan t$  and  $\sec t$  where  $t$  is the radian measure of the angle shown.

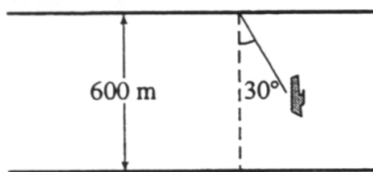
123) \_\_\_\_\_



Enter just a, b where a represents  $\tan t$  and b represents  $\sec t$ , fractions and quotients reduced of form  $\frac{c}{d}$  or  $\frac{\sqrt{f}}{g}$  (no labels and no approximations).

124) A river is 600 m wide. A boat enters the water and is pushed by the current at an angle of  $30^\circ$  to its original position. How far downstream from its original position will the boat land?

124) \_\_\_\_\_



Enter your answer in the reduced form  $a\sqrt{b}$  (no units).

125) A ladder leaning against a building makes an angle of  $60^\circ$  with the ground. If the base of the ladder is 3 feet from the building, how far up the building will the ladder reach?

125) \_\_\_\_\_

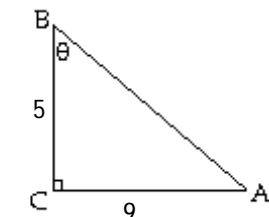
Enter your answer in the reduced form  $a\sqrt{b}$  (no units).

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

Find the indicated trigonometric function, where  $\theta$  is the radian measure of the given angle. Give an exact answer with a rational denominator.

126) Find  $\sec \theta$ .

126) \_\_\_\_\_



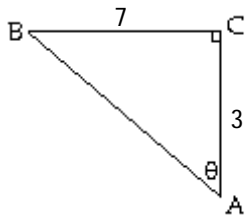
A)  $\frac{\sqrt{106}}{5}$

B)  $\frac{5\sqrt{106}}{9}$

C)  $\frac{5\sqrt{106}}{106}$

D)  $\frac{9\sqrt{106}}{106}$

127) Find  $\tan \theta$ .



- A)  $\frac{7}{3}$       B)  $\frac{3}{7}$       C)  $\frac{\sqrt{58}}{7}$       D)  $\frac{\sqrt{58}}{3}$

127) \_\_\_\_\_

Find the derivative of the function.

128)  $y = \cot(5x - 3)$

- A)  $\frac{dy}{dx} = -5 \sec^2(5x - 3)$       B)  $\frac{dy}{dx} = -\csc^2(5x - 3)$   
 C)  $\frac{dy}{dx} = -5 \csc^2(5x - 3)$       D)  $\frac{dy}{dx} = 5 \cot(5x - 3) \csc(5x - 3)$

128) \_\_\_\_\_

129)  $y = x^7 - \csc x + 17$

- A)  $\frac{dy}{dx} = 7x^6 + \cot^2 x$       B)  $\frac{dy}{dx} = 7x^6 - \csc x \cot x$   
 C)  $\frac{dy}{dx} = x^6 - \cot^2 x + 17$       D)  $\frac{dy}{dx} = 7x^6 + \csc x \cot x$

129) \_\_\_\_\_

Differentiate.

130)  $f(x) = e^{3x} \tan(x^2)$

- A)  $3e^x \sec^2 x^2$   
 B)  $6xe^x \sec^2 x^2$   
 C)  $3e^x \tan x^2 + e^{3x} \sec^2 x^2$   
 D)  $3e^{3x} \tan x^2 + 2xe^{3x} \sec^2(x^2)$   
 E) none of these

130) \_\_\_\_\_

131)  $f(x) = (\sin x + \cos x)^5$

- A)  $5(\sin x + \cos x)^4$   
 B)  $5(\sin x + \cos x)^4(\cos x - \sin x)$   
 C)  $5(\sin x + \cos x)^5$   
 D)  $(\cos x - \sin x)^5$   
 E) none of these

131) \_\_\_\_\_

- 132)  $f(x) = \tan(\cos x)$   
 A)  $\sec^2(\cos x)$   
 B)  $-\sin x \sec^2(\cos x)$   
 C)  $\tan(-\sin x)$   
 D)  $\tan(\cos x) \sec(\cos x)$   
 E) none of these

132) \_\_\_\_\_

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 133)  $f(t) = \ln(\sec t)$   
 Do not label your answer, no parentheses.

133) \_\_\_\_\_

- 134)  $f(x) = 2 \sec x$   
 Enter your answer without parentheses, secants before tangents in terms, no labels.

134) \_\_\_\_\_

- 135)  $f(x) = 2 \cot^3 x$   
 Enter your answer without parentheses, no labels, use the multiplication dot between functions..

135) \_\_\_\_\_

- 136)  $f(x) = \tan(3x) \sin x$   
 Enter your answer without parentheses, no labels, any term containing sine appearing first.

136) \_\_\_\_\_

- 137)  $f(x) = \sqrt{\tan x + \sin x}$   
 Enter your answer without parentheses, no labels. Enter a quotient  $\frac{a}{b\sqrt{c}}$ .

137) \_\_\_\_\_

- 138)  $f(x) = e^{x^3} \cdot \tan 2x$   
 Enter your answer without parentheses except as indicated in this form,  $e^{P(x)}(ab + 2d)$ .

138) \_\_\_\_\_

- 139)  $f(x) = \ln(e^x \cdot \tan 2x)$   
 Enter your answer without parentheses or labels, no multiplication dot.

139) \_\_\_\_\_

- 140)  $f(x) = \frac{\sin x^2}{\tan x}$   
 Enter a quotient with cosine and sine functions last in their terms. No parentheses or labels or multiplication dots.

140) \_\_\_\_\_

- 141)  $f(x) = \ln(\tan x) + \tan x$   
 Enter your answer exactly in the form  $a \cdot (b + c)$ .

141) \_\_\_\_\_

- 142)  $f(t) = \tan t^6$   
 Enter your answer without parentheses, no labels.

142) \_\_\_\_\_

- 143)  $f(t) = (\sec 3t)^6$  143) \_\_\_\_\_  
 Enter your answer without parentheses or labels, use a multiplication dot between the last two functions.
- 144)  $f(x) = \sec x^2$  144) \_\_\_\_\_  
 Enter your answer without parentheses or labels. Use the multiplication dot between the last two functions of x.
- 145)  $f(t) = \csc t^{-3}$  145) \_\_\_\_\_  
 Enter your answer without parentheses or labels. No multiplication dots. Enter your answer as a quotient leaving  $t^{-3}$  in that form.
- 146)  $f(t) = \cot\left(\frac{1}{t}\right)$  146) \_\_\_\_\_  
 Enter just an unlabeled quotient of functions of t. No parentheses.
- 147)  $f(t) = \frac{\sec 3t}{\tan 5t}$  147) \_\_\_\_\_  
 Enter your answer without parentheses or labels. Enter a quotient of functions of t of form  $\frac{a-b}{c}$  using multiplication dots between all functions of t.
- 148)  $f(x) = \sec \sqrt{x}$  148) \_\_\_\_\_  
 Enter your answer without parentheses, no labels, leave  $\sqrt{x}$  in your answer which should be entered as a quotient  $\frac{ab}{c}$  in terms of functions of  $\sqrt{x}$ .
- 149)  $f(x) = \csc^3 x$  149) \_\_\_\_\_  
 Enter your answer without parentheses, no labels, use the multiplication dot between functions of x.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 150) Find the equation of the tangent line to the graph of  $f(x) = \tan x$  at  $\left(\frac{\pi}{4}, 1\right)$ . 150) \_\_\_\_\_
- A)  $y = 2x + 1 - \frac{\pi}{2}$
- B)  $y = 2x + \frac{\pi}{2}$
- C)  $y = 2x - 1$
- D)  $y = 2x - \frac{\pi}{2}$
- E) none of these

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

151) Find the equation of the tangent line to the graph of  $y = \ln(\tan x)$  at  $x = \frac{\pi}{4}$ . 151) \_\_\_\_\_

Enter your answer in standard slope-intercept form with any quotients reduced with  $\pi$  in the numerator.

152) Find the slope of the tangent line to the graph of  $y = e^{\tan x}$  at  $x = 0$ . 152) \_\_\_\_\_  
Enter just an integer.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

Integrate.

153)  $\int e^x \sec^2(e^x) dx$  153) \_\_\_\_\_

- A)  $\tan(e^x) + C$
- B)  $\tan^2(e^x) + C$
- C)  $e^x \tan(e^x) + C$
- D)  $\frac{\tan(e^x)}{e^x} + C$
- E) none of these

154)  $\int \sec^2(1 - 2x) dx$  154) \_\_\_\_\_

- A)  $-\frac{1}{2}\tan(1 - 2x) + C$
- B)  $-2\tan(1 - 2x) + C$
- C)  $2\tan(1 - 2x) + C$
- D)  $\tan(1 - 2x) + C$
- E) none of these

155)  $\int_0^1 \sec^2\left(\frac{\pi x}{4}\right) dx$  155) \_\_\_\_\_

- A)  $\frac{\pi}{2}$
- B)  $\frac{\pi}{4}$
- C)  $\frac{4}{\pi}$
- D)  $-\frac{\pi}{4}$
- E) none of these



**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

156)  $\int \sec^2 5x \, dx$

Enter your answer without parentheses.

156) \_\_\_\_\_

157)  $\int \csc^2(3x + 1) \, dx$

Enter your answer using parentheses around the argument of the function.

157) \_\_\_\_\_

158)  $\int \frac{5}{\cos^2 3x} \, dx$

Enter your answer without parentheses.

158) \_\_\_\_\_

159)  $\int_0^{\pi/2} \sec^2\left(x + \frac{\pi}{4}\right) \, dx$

Enter just an integer.

159) \_\_\_\_\_

160)  $\int_0^{\pi/4} \sec^2 x \, dx$

Enter just an integer.

160) \_\_\_\_\_

Answer Key

Testname: UNTITLED8

- 1) D
- 2) C
- 3)  $\frac{\pi}{18}$
- 4)  $\frac{\pi}{30}$
- 5)  $-\frac{11\pi}{36}$
- 6)  $\frac{38\pi}{9}$
- 7)  $\frac{\pi}{12}$
- 8)  $-\frac{7\pi}{6}$
- 9)  $\frac{13\pi}{3}$
- 10) C
- 11) B
- 12) B
- 13) D
- 14) B
- 15) D
- 16) D
- 17) B
- 18)  $120^\circ$
- 19)  $-36^\circ$
- 20)  $870^\circ$
- 21)  $810^\circ$
- 22)  $72^\circ$
- 23)  $-540^\circ$
- 24) yes
- 25) D
- 26) C
- 27) D
- 28)  $-\frac{3}{5}, -\frac{4}{5}$
- 29)  $\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}$
- 30) 0.4
- 31) 5.7
- 32) 2.8
- 33) B
- 34) A
- 35) D

Answer Key

Testname: UNTITLED8

36)  $\frac{2\pi}{3}$

37)  $\frac{5\pi}{6}$

38)  $-\frac{\pi}{3}$

39) C

40) B

41) B

42) 0, -1

43) C

44) D

45) A

46) B

47) D

48) B

49) D

50) A

51) A

52) B

53) B

54) A

55) D

56) B

57) D

58) C

59) B

60) D

61) B

62) B

63) C

64)  $\sin x + x \cos x$

65)  $-2 \cos x \sin^4 x + 3 \cos^3 x \sin^2 x$

66)  $\cos x \cos 3x - 3 \sin x \sin 3x$

67)  $2x \cos x^2$

68)  $6 \cos x \cos 2x - 3 \sin x \sin 2x$

69)  $-2 \cos(x + 4) \sin(x + 4)$

70)  $9x^2 \sin^2(x^3) \cos(x^3)$

71)  $3 \cos 3x$

72)  $6x \cos 3x^2$

73)  $-16 \cos 4t \sin 4t$

74)  $\frac{3 \cos 3t}{\sin 3t}$

Answer Key

Testname: UNTITLED8

75)  $-e^{\sin(\cos t)} \cos(\cos t) \sin(t)$

76)  $-12x \cos(\sin x) \cos x \sin(\sin x) + 6\cos^2(\sin x)$

77)  $9 \sin^2(3t) \cos(3t)$

78)  $\sin x \cdot (\sin(\cos x))$

79)  $\frac{2 \sin x - 1}{(\sin x - 2)^2}$

80)  $3x^2 e^{x^3} \cdot (\sin x^3 + \cos x^3)$

81)  $\frac{\cos x}{1 + \sin x}$

82) E

83) E

84) A

85) A

86) D

87)  $y - 2 = 3 \left( x - \frac{\pi}{2} \right)$

88) -1

89)  $-2\sqrt{3}$

90) 3

91) C

92) D

93) A

94) A

95) A

96) A

97) B

98) B

99) D

100) C

101)  $\frac{1}{7} \sin 7x + C$

102)  $-\frac{1}{2} \cos^2 t + C$

103)  $-\frac{1}{3} \cos(3t + 2) + C$

104)  $-\frac{1}{4} \cos 4t + C$

105)  $\frac{3}{2} \sin(2x) + C$

106)  $\frac{1}{2} \sin 2t + C$

107)  $-2 \cos 2t + C$

108) 1

Answer Key

Testname: UNTITLED8

109) C

110)  $\frac{2}{3}$

111)  $\frac{\sqrt{2} + 1}{2}$

112) A

113) C

114) 7200, 1200

115)  $\frac{175\pi\sqrt{2}}{12}$

116) 90

117) 1000

118) D

119) D

120) C

121)  $1, \sqrt{2}$

122)  $\frac{3}{4}, -\frac{5}{4}$

123)  $\frac{1}{2}, -\frac{\sqrt{5}}{2}$

124)  $200\sqrt{3}$

125)  $3\sqrt{3}$

126) A

127) A

128) C

129) D

130) D

131) B

132) B

133)  $\tan t$

134)  $2 \sec x \tan x$

135)  $-6 \cot^2 x \cdot \csc^2 x$

136)  $3 \sec^2 3x \sin x + \cos x \tan 3x$

137)  $\frac{\sec^2 x + \cos x}{2\sqrt{\tan x + \sin x}}$

138)  $e^{x^3}(3x^2 \tan 2x + 2 \sec 2x)$

139)  $1 + 2 \csc 2x \sec 2x$

140)  $\frac{2x \tan x \cos x^2 - \sec^2 x \sin x^2}{\tan^2 x}$

141)  $\sec x \cdot (\csc x + \sec x)$

142)  $6t^5 \sec^2 t^6$

143)  $18 \sec^6 3t \cdot \tan 3t$

Answer Key

Testname: UNTITLED8

144)  $2x \sec x^2 \cdot \tan x^2$

145)  $\frac{3 \csc t^{-3} \cot t^{-3}}{t^4}$

146)  $\frac{\csc^2\left(\frac{1}{t}\right)}{t^2}$

147)  $\frac{3 \sec 3t \cdot \tan 3t \cdot \tan 5t - 5 \sec^2 5t \cdot \sec 3t}{\tan^2 5t}$

148)  $\frac{\sec \sqrt{x} \tan \sqrt{x}}{2\sqrt{x}}$

149)  $-3 \cot x \cdot \csc^3 x$

150) A

151)  $y = 2x - \frac{\pi}{2}$

152) 1

153) A

154) A

155) C

156)  $\frac{1}{5} \tan 5x + C$

157)  $-\frac{1}{3} \cot(3x + 1) + C$

158)  $\frac{5}{3} \tan 3x + C$

159) -2

160) 1