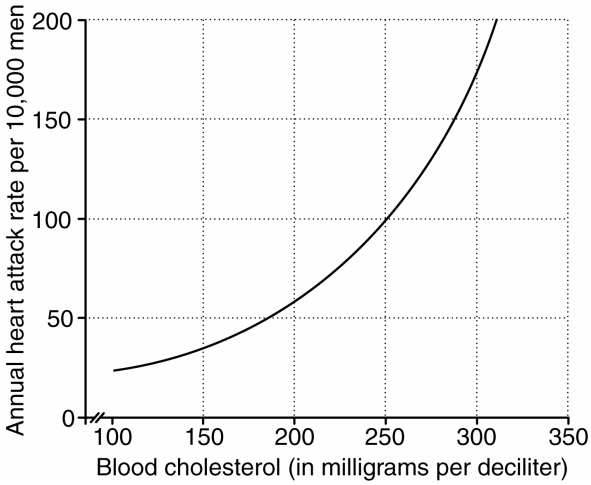
CALCULUS FOR THE LIFE SCIENCES

Name: _____

Chapter 1, Form A

1. *Heart Attacks and Cholesterol.* The following graph relates the annual heart attach rate per 10,000 men and their blood cholesterol level. (Copyright 1989, CSPI, Adapted from *Nutrition Action Healthletter*)



Use the graph to answer the following:

(a) What is the annual heart attack rate per 10,000 men for those whose blood cholesterol level is 275 mg/dl? **1. (a)** _____

(b) What is the blood cholesterol level for men with a heart attack rate of 100 attacks per 10,000 individuals? **1. (b)** _____

2. A function is given by $f(x) = x^3 - 4$. Find

(a) $f(-2)$. **2. (a)** _____

(b) $f(x+h)$. **2. (b)** _____

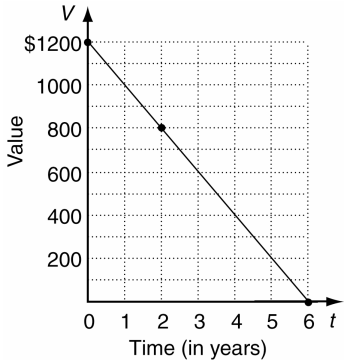
3. What are the slope and the y-intercept of $y = -\frac{1}{2}x - 5$? **3.** _____

4. Find an equation of the line with slope $\frac{2}{3}$, containing the point $(3, -6)$. **4.** _____

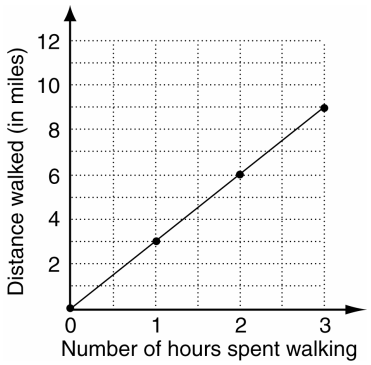
5. Find the slope of the line containing the points $(3, -2)$ and $(-6, -8)$. **5.** _____

Find the average rate of change.

6.



7.



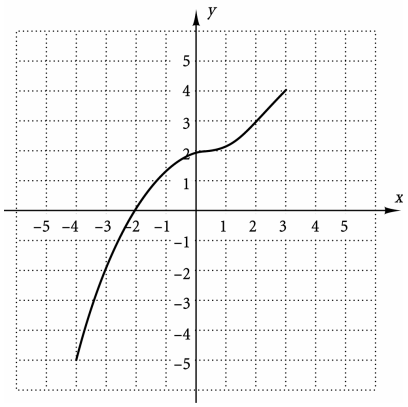
6. _____

7. _____

8. *Ohm's Law.* The electrical current *I*, in amperes, in a circuit is directly proportional to the voltage *V*. When 45 volts are applied, the current is 15 amperes. Find an equation of variation expressing *I* as a function of *V*.

8. _____

9. For the following graph of function, *f*, determine **(a)** $f(1)$**;** **(b)** the domain; **(c)** all *x*-values such that $f(x) = 3$; and **(d)** the range.



9.(a) _____

9.(b) _____

9.(c) _____

9.(d) _____

10. Solve for *x*: $x^2 + 4x - 8 = 0$.

10. _____

11. Convert to rational exponents: $\dfrac{1}{\sqrt[5]{x^4}}$.

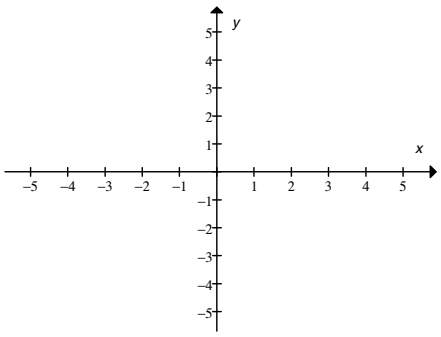
11. _____

12. Convert to radical notation: $y^{-2/3}$.

12. _____

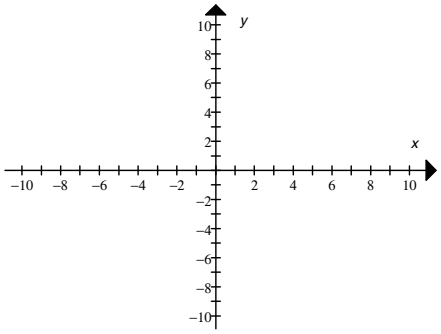
13. Graph: $f(x)=\dfrac{2}{x}$

13.



14. Graph: $f(x)=\dfrac{x^2-16}{x-4}$

14.



Determine the following exactly.

15. $\cos(-5\pi/6)$

15. _____

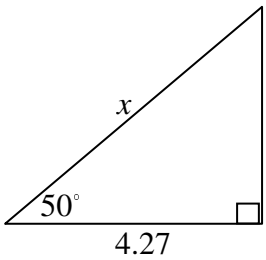
16. $\sin(5\pi/6)$

16. _____

17. $\tan(\pi/2)$

17. _____

18. Solve for the missing side, *x*.



18. _____

Find all values of *t* that satisfy the equation.

19. $4\sin^2 t = 3$ **19.** _____

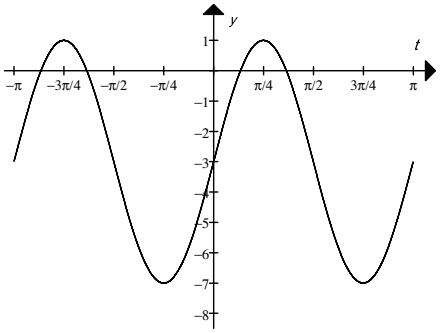
20. $2\sin^2 t - \sin t - 1 = 0$ **20.** _____

For each of the following functions, find the amplitude, period, and midline. Also, find the maximum and minimum

21. $y = 3\sin(2t) - 4$ **21.** _____

22. $y = \cos(2t) - 2$ **22.** _____

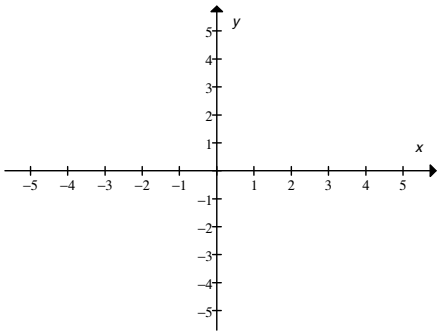
23. Determine if the graph should be modeled by either $y = a\sin bt + k$ or $y = a\cos bt + k$, Then find *a, b*, and *k*.



23. _____

24. Graph: $f(x) = \begin{cases} x^2 + 1, & \text{for } x \geq 1 \\ x - 2, & \text{for } x < -1 \end{cases}$

24.



25. *Milk Consumption.* The number of gallons of lowfat milk consumed by the average American in a year for several years is recorded in the following table. (Copyright 1990, CSPI. Adapted from *Nutrition Action Healthletter.*)

Year, x	*Number of Gallons, g*
1970	4.5
1975	7
1980	9
1985	11
1990	12.5
1995	12

(a) Using the data points (1975, 7) and (1995, 12) find a linear function that fits the data. **25. (a)** _____

(b) Use the linear function to predict the number of gallons of lowfat milk the average American drank in 1988. **25. (b)** _____

---

26. Solve for x: $2+\frac{1}{x}=-2x$. **26.** _____

---

27. Use your grapher to graph: $f(x)=x^3-4x^2+2x-3$.
Then sketch the graph below.

27.

28. Find the zeros of the function: $f(x)=\sqrt[3]{|x^2-9|}-3$. **28.** _____

29. *Milk Consumption*. Use the data in Question 25.

(a) Use the REGRESSION feature to fit a linear function to the data. **29. (a)** _____

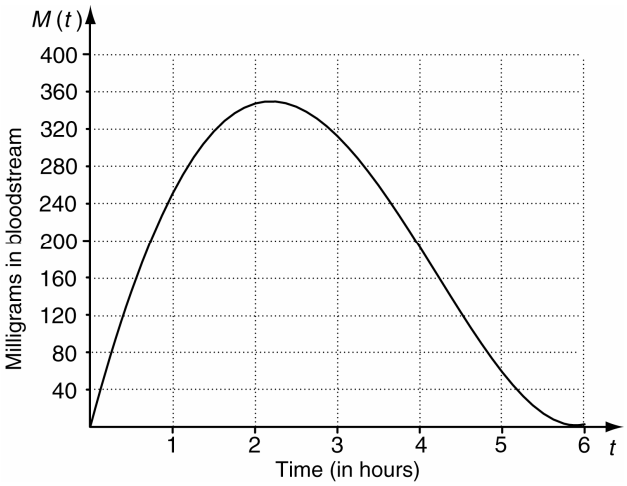
(b) Use the linear function to predict the lowfat milk consumption of the average American 1988. **29. (b)** _____

CALCULUS FOR THE LIFE SCIENCES

Name: _____

Chapter 1, Form B

1. *Medicine*. The following graph relates the number of milligrams of ibuprofen in the bloodstream to the number of hours that have elapsed since 400 mg of the medication was swallowed.



Use the graph to answer the following:

(a) How much ibuprofen is in the bloodstream three hours after swallowing 400 mg? **1. (a)** _____

(b) For what lengths of time is there approximately 140 mg of ibuprofen in the bloodstream? **1. (b)** _____

2. A function is given by $f(x) = 2x^3 + 4$. Find

(a) $f(-2)$. **2. (a)** _____

(b) $f(x+a)$. **2. (b)** _____

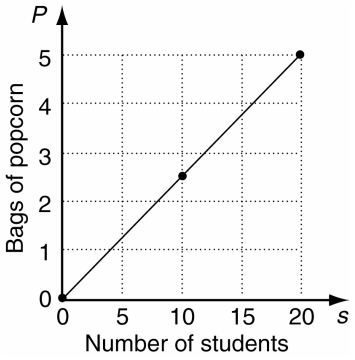
3. What are the slope and the y-intercept of $y = -4x + 5$? **3.** _____

4. Find an equation of the line with slope $\frac{2}{5}$, containing the point $(5, -2)$. **4.** _____

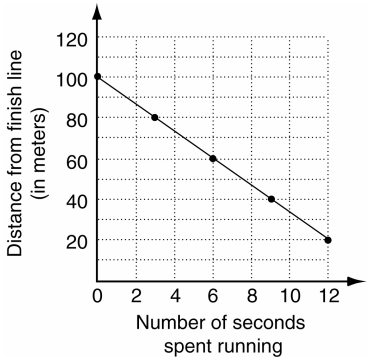
5. Find the slope of the line containing the points $(4, -2)$ and $(8, 5)$. **5.** _____

Find the average rate of change.

6.



7.



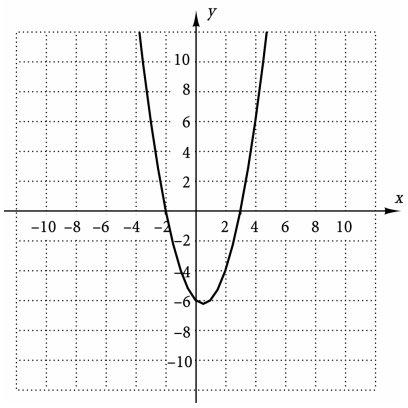
6. _____

7. _____

8. *Hooke's Law.* Hooke's Law for Springs, states that the distance d, a spring is stretched or compressed is directly proportional to the force F, in newtons. When 25 newtons are applied, the spring stretched 0.5 meter. Find an equation of variation expressing F as a function of d.

8. _____

9. For the following graph of function, f, determine **(a)** $f(-1)$**;** **(b)** the domain; **(c)** all x-values such that $f(x) = 0$; and **(d)** the range.



9.(a) _____

9.(b) _____

9.(c) _____

9.(d) _____

10. Solve for x: $x^2 - 2x - 4 = 0$.

10. _____

11. Convert to rational exponents: $\dfrac{1}{\sqrt[3]{y^2}}$.

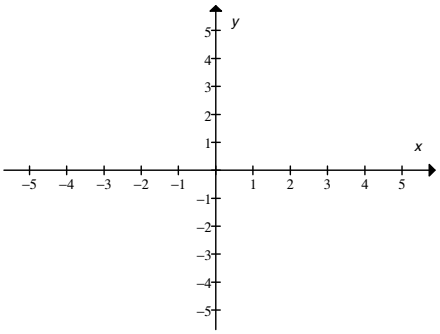
11. _____

12. Convert to radical notation: $p^{-3/4}$.

12. _____

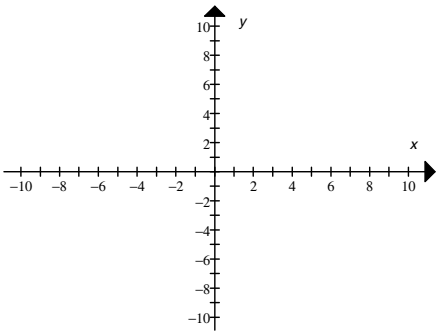
11. Graph: $f(x)=\dfrac{3}{x}$

11.



14. Graph: $f(x)=\dfrac{x^2-x-6}{x+2}$

14.



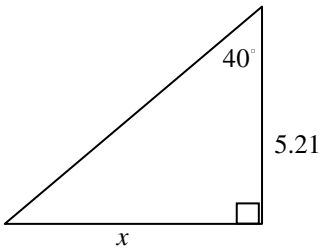
Determine the following exactly.

15. $\sin(3\pi/4)$ **15.** _____

16. $\cos(5\pi/6)$ **16.** _____

17. $\tan(-\pi/2)$ **17.** _____

18. Solve for the missing side, *x*.



18. _____

Find all values of *t* that satisfy the equation.

19. $4\cos^2 t = 3$ **19.** _____

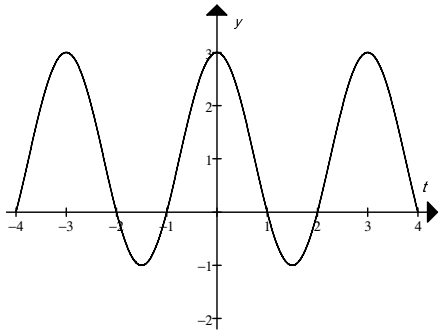
20. $2\cos^2 t + 3\cos t + 1 = 0$ **20.** _____

For each of the following functions, find the amplitude, period, and midline. Also, find the maximum and minimum

21. $y = \frac{1}{2}\cos(3\pi t) + 3$ **21.** _____

22. $y = 2\sin\left(\frac{t}{3}\right) - 2$ **22.** _____

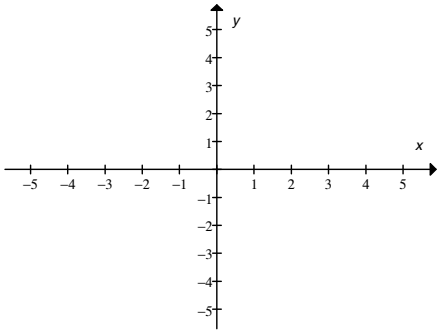
23. Determine if the graph should be modeled by either $y = a\sin bt + k$ or $y = a\cos bt + k$, Then find *a, b*, and *k*.



23. _____

24. Graph: $f(x) = \begin{cases} x^2 - 4, & \text{for } x \geq 0 \\ x + 1, & \text{for } x < 0 \end{cases}$

24.



25. *Computer Prices.* The following table lists the average price, in dollars, of a personal computer at Jaytech in several recent years.

Year, x	*Average price, p*
1993	1630
1996	1540
1999	1270
2002	990
2005	640

(a) Using the data points (1993, 1630) and (1999, 1270) find a linear function that fits the data. **25. (a)** _____

(b) Use the linear function to estimate the average price of a personal computer in 2001. **25. (b)** _____

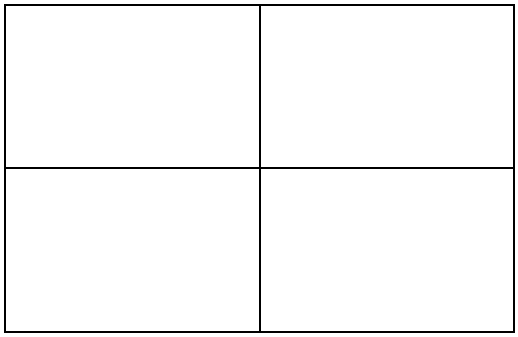
---

26. Solve for x: $9x + \frac{8}{x} = 12$. **26.** _____

---

27. Use your grapher to graph: $f(x) = 5x^3 - 6x^2 + x - 2$.
Then sketch the graph below.

27.



28. Find the zeros of the function: $f(x) = \left|\sqrt{x^2 - 4} - 5\right| - 6$. **28.** _____

29. *Computer Prices*. Use the data in Question 25.

(a) Use the REGRESSION feature to fit a linear function to the data. **29. (a)** _____

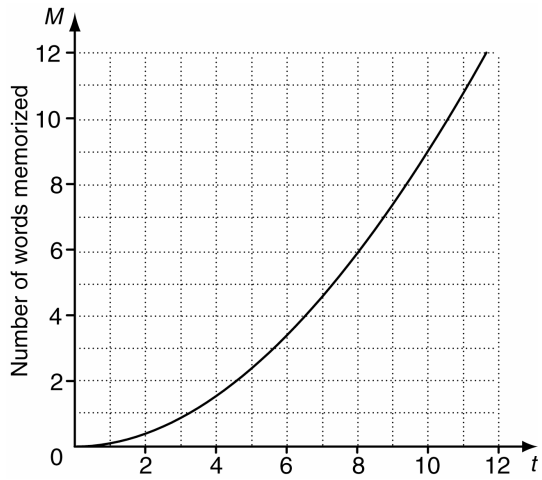
(b) Use the linear function to estimate the average price of a personal computer in 1997. **29. (b)** _____

CALCULUS FOR THE LIFE SCIENCES

Name: _____

Chapter 1, Form C

1. *Memory.* The following graph relates the average number of words participants in a psychology experiment were able to memorize in a given amount of time.



Use the graph to answer the following:

(a) Estimate the number of words memorized after 8 min. **1. (a)** _____

(b) After how many minutes is the number of words memorized approximately ten? **1. (b)** _____

2. A function is given by $f(x) = 3x^2 - 5$. Find

(a) $f(-7)$. **2. (a)** _____

(b) $f(x+1)$. **2. (b)** _____

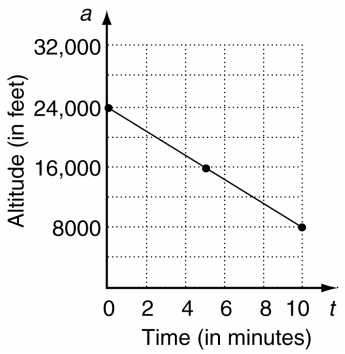
3. What are the slope and the y-intercept of $y = -\frac{2}{3}x + 8$? **3.** _____

4. Find an equation of the line with slope $-\frac{5}{8}$, containing the point $(4, 0)$. **4.** _____

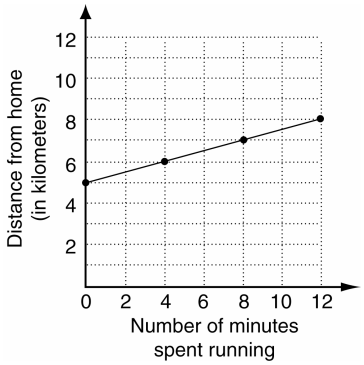
5. Find the slope of the line containing the points $(2, 9)$ and $(-5, -6)$. **5.** _____

Find the average rate of change.

6.



7.



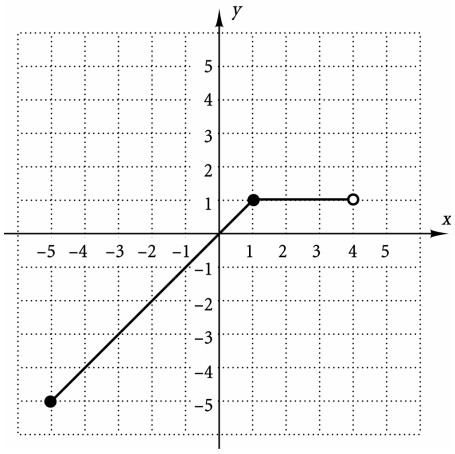
6. _____

7. _____

8. *Weight of the Moon.* The weight M of an object on the moon is directly proportional to its weight E on earth. A person who weighs 192 lb on Earth weighs 32 lb on the moon. Find an equation of variation expressing E as a function of M.

8. _____

9. For the following graph of function, f, determine **(a)** $f(-2)$; **(b)** the domain; **(c)** all x-values such that $f(x)=1$; and **(d)** the range.



9.(a) _____

9.(b) _____

9.(c) _____

9.(d) _____

10. Solve for x: $x^2+8x+13=0$.

10. _____

11. Convert to rational exponents: $\dfrac{5}{\sqrt[3]{x}}$.

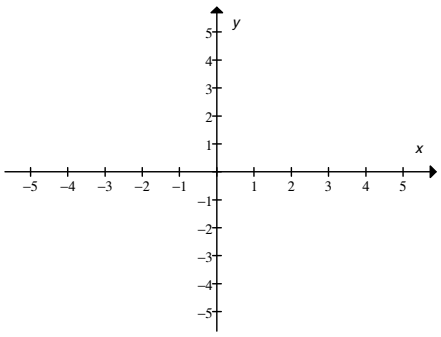
11. _____

12. Convert to radical notation: $a^{-6/7}$.

12. _____

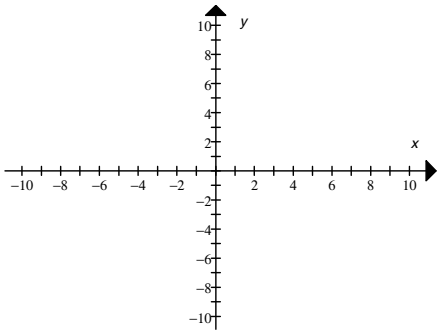
13. Graph: $f(x)=\dfrac{6}{(x-3)}$

13.



14. Graph: $f(x)=\dfrac{x^2-3x-10}{x+2}$

14.



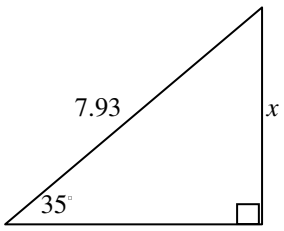
Determine the following exactly.

15. $\cos(7\pi/6)$ **15.** _____

16. $\sin(\pi/2)$ **16.** _____

17. $\tan(3\pi/2)$ **17.** _____

18. Solve for the missing side, *x*.



18. _____

Find all values of *t* that satisfy the equation.

19. $2\sin^2 t = 1$ **19.** _____

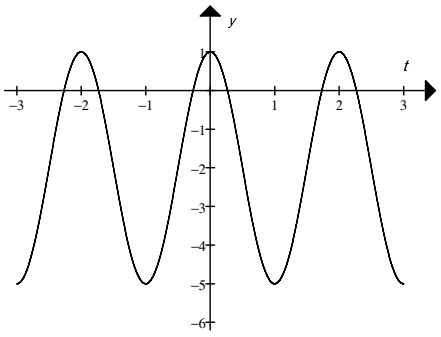
20. $\cos^2 t + \cos t = 0$ **20.** _____

For each of the following functions, find the amplitude, period, and midline. Also, find the maximum and minimum.

21. $y = 2\cos\left(\frac{t}{2}\right) - 5$ **21.** _____

22. $y = \frac{1}{2}\sin(3t) + \frac{3}{2}$ **22.** _____

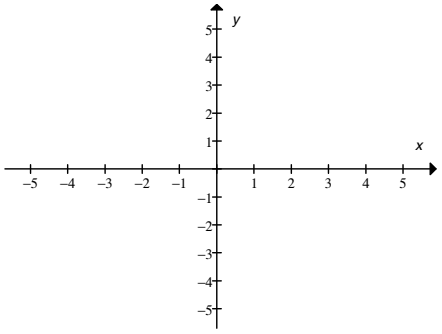
23. Determine if the graph should be modeled by either $y = a\sin bt + k$ or $y = a\cos bt + k$, Then find *a, b*, and *k*.



23. _____

24. Graph: $f(x) = \begin{cases} -x^2 - 3, & \text{for } x \geq -2 \\ x - 1, & \text{for } x < -2 \end{cases}$

24.



25. *Total Revenue.* The following table lists the revenue in thousands of dollars, of a small bike shop for various years.

Year, x	*Total Revenue, R (in thousands)*
1997	85
1998	94
1999	97
2001	100
2003	105

(a) Using the data points (1997, 85) and (1999, 97) find a linear function that fits the data. **25. (a)** _____

(b) Use the linear function to predict the revenue of the bike shop in 2005. **25. (b)** _____

---

26. Solve for x: $4x + \frac{11}{x} = 12$. **26.** _____

---

27. Use your grapher to graph: $f(x) = 2x^3 - 5x^2 + x - 4$.
Then sketch the graph below.

27.

28. Find the zeros of the function: $f(x) = \left|\sqrt{x^2 - 1} - 3\right| - 5$. **28.** _____

29. *Total Revenue*. Use the data in Question 25.

(a) Use the REGRESSION feature to fit a linear function to the data. **29. (a)** _____

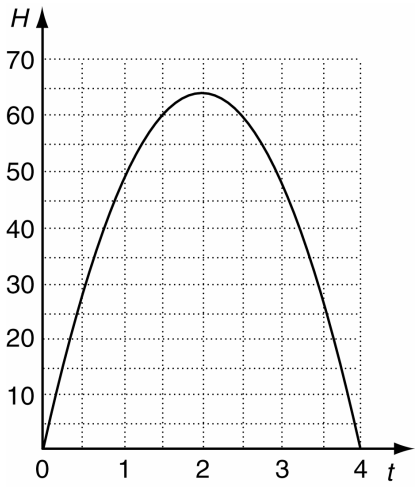
(b) Use the linear function to predict the revenue of the bike shop in 2007. **29. (b)** _____

CALCULUS FOR THE LIFE SCIENCES

Name: _____

Chapter 1, Form D

1. *Height of a Projectile.* The following graph relates the height *H*, in feet, of a projectile with an initial velocity of 64 ft/sec to the number of seconds *t* after a launch.



Use the graph to answer the following:

(a) What is the height of the projectile 3 sec after launch? **1. (a)** _____

(b) How many seconds after launch is the projectile 28 ft above ground? **1. (b)** _____

2. A function is given by $f(x) = 2x^2 + 3$. Find

(a) $f(-1)$. **2. (a)** _____

(b) $f(a-3)$. **2. (b)** _____

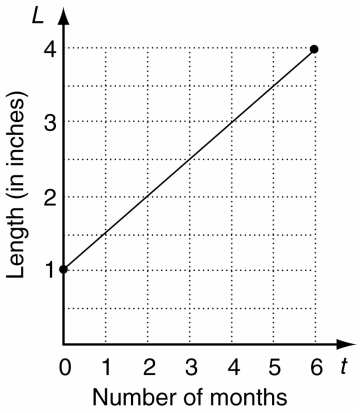
3. What are the slope and the *y*-intercept of $y = 5x - 4$? **3.** _____

4. Find an equation of the line with slope $\frac{5}{8}$, containing the point $(6, -2)$. **4.** _____

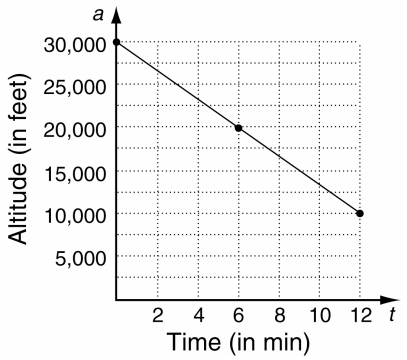
5. Find the slope of the line containing the points $(-3,9)$ and $(5,-3)$. **5.** _____

Find the average rate of change.

6.



7.



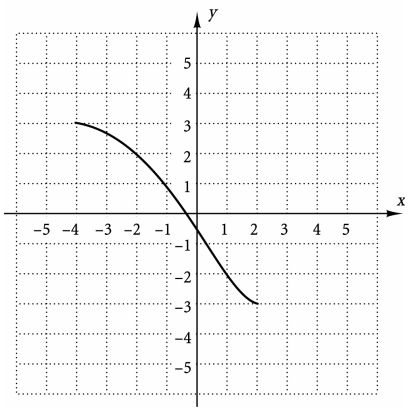
6. _____

7. _____

8. *Charles's Law.* Charles's Law states that the *volume V*, occupied by a gas (at a constant pressure) is directly proportional to its absolute temperature *T*. An experiment with balloon shows that the volume of the balloon is 0.80 liter at 270 *K*. Find an equation of variation expressing *T* as a function of *V*.

8. _____

9. For the following graph of function, *f*, determine **(a)** $f(1)$**;** **(b)** the domain; **(c)** all *x*-values such that $f(x) = 2$; and **(d)** the range.



9.(a) _____

9.(b) _____

9.(c) _____

9.(d) _____

10. Solve for *x*: $x^2 + 8x + 13 = 0$.

10. _____

11. Convert to rational exponents: $\dfrac{5}{\sqrt[3]{n}}$.

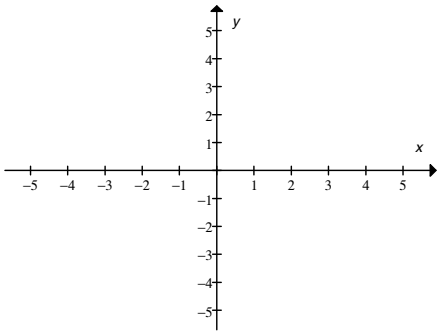
11. _____

12. Convert to radical notation: $y^{-4/7}$.

12. _____

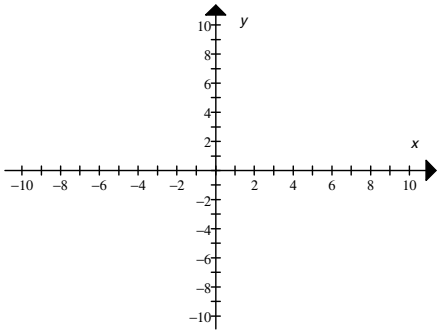
13. Graph: $f(x) = \dfrac{-3}{x-4}$

13.



14. Graph: $f(x) = \dfrac{x^2 - 9}{x+3}$

14.



Determine the following exactly.

15. $\sin(-5\pi/4)$

15. _____

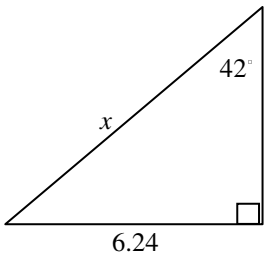
16. $\cos(-2\pi/3)$

16. _____

17. $\tan(3\pi/2)$

17. _____

18. Solve for the missing side, *x*.



18. _____

Find all values of *t* that satisfy the equation.

19. $3\tan^2 t = 1$ **19.** _____

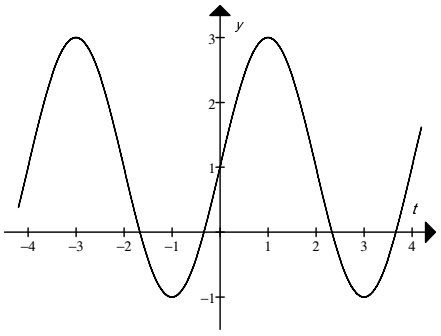
20. $2\sin^2 t + \sin t - 1 = 0$ **20.** _____

For each of the following functions, find the amplitude, period, and midline. Also, find the maximum and minimum

21. $y = 4\sin(\pi t) + 1$ **21.** _____

22. $y = 3\cos(3t) - 1$ **22.** _____

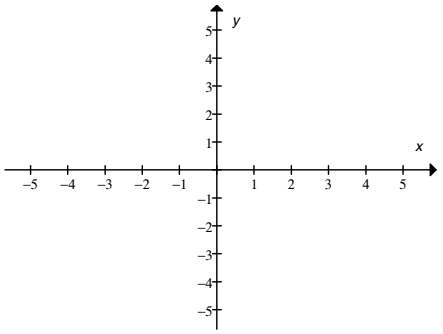
23. Determine if the graph should be modeled by either $y = a\sin bt + k$ or $y = a\cos bt + k$, Then find *a, b*, and *k*.



23. _____

24. Graph: $f(x) = \begin{cases} x^2 - 4, & \text{for } x \geq 1 \\ x + 3, & \text{for } x < 1 \end{cases}$

24.



25. *Average Income.* The following table shows the average yearly income, in dollars, of individuals based on years of schooling.

Years of Schooling, x	*Average Income, I*
8	18,000
10	20,000
12	26,000
14	30,000

(a) Using the data points (8, 18,000) and (14, 30,000) find a linear function that fits the data. **25. (a)** _____

(b) Use the linear function to predict average income for an individual with 16 years of schooling. **25. (b)** _____

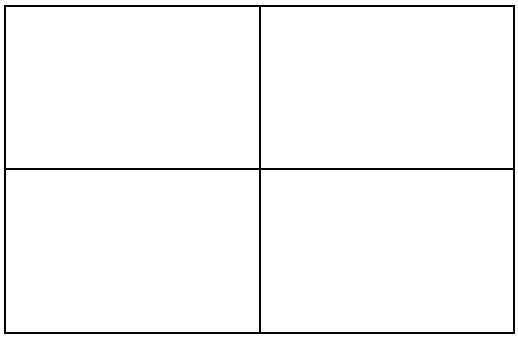
---

26. Solve for x: $x+1=-\frac{1}{x}$. **26.** _____

---

27. Use your grapher to graph: $f(x)=x^3-2x^3-2x+3$.
Then sketch the graph below.

27.



28. Find the zeros of the function: $f(x)=\left|\sqrt[3]{x^2+1}\right|-4$. **28.** _____

29. *Average Income*. Use the data in Question 25.

(a) Use the REGRESSION feature to fit a linear function to the data. **29. (a)** _____

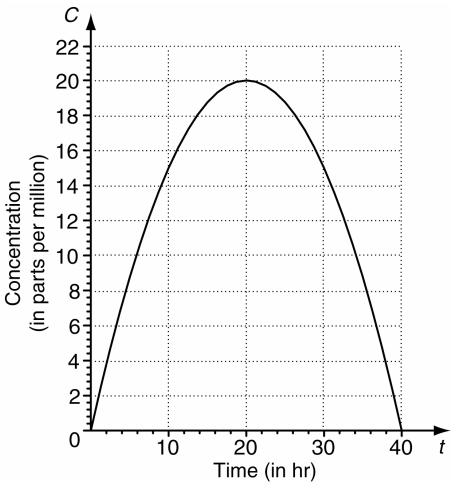
(b) Use the linear function to estimate the average income of an individual with 13 years of schooling. **29. (b)** _____

CALCULUS FOR THE LIFE SCIENCES

Name: _____

Chapter 1, Form E

1. *Medical Concentration.* The concentration C, in parts per million, of a certain antibiotic in the bloodstream after t hours is illustrated in the following graph.



Use the graph to answer the following:

(a) Find the approximate concentration after 10 hr. **1. (a)** _____

(b) For lengths of time is the concentration approximately 8 parts per million? **1. (b)** _____

2. A function is given by $f(x) = 4x^2 + x$. Find

(a) $f(-4)$. **2. (a)** _____

(b) $f(x-2)$. **2. (b)** _____

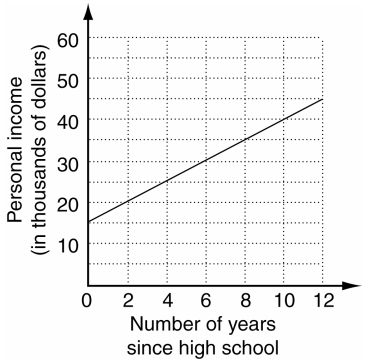
3. What are the slope and the y-intercept of $y = -2x - 6$? **3.** _____

4. Find an equation of the line with slope $-\frac{1}{4}$, containing the point $(2, -8)$. **4.** _____

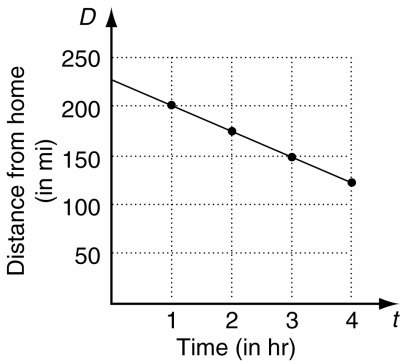
5. Find the slope of the line containing the points $(-1,1)$ and $(2,-8)$. **5.** _____

Find the average rate of change.

6.



7.



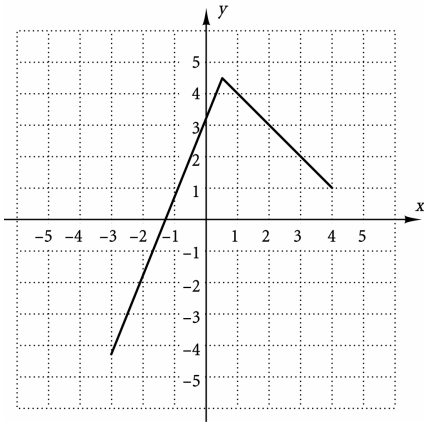
6. _____

7. _____

8. *Pressure and Depth.* The pressure P, in lb/ft^2, a liquid exerts at a given point on a submarine is directly proportional to the depth d, in feet, of the point below the surface of the liquid. When a given point is 3 ft below the surface of the liquid, the pressure is 187.5 lb/ft^2. Find an equation of variation expressing P as a function of d.

8. _____

9. For the following graph of function, f, determine **(a)** $f(3)$; **(b)** the domain; **(c)** all x-values such that $f(x) = 2$; and **(d)** the range.



9.(a) _____

9.(b) _____

9.(c) _____

9.(d) _____

10. Solve for x: $x^2 + 4x - 3 = 0$.

10. _____

11. Convert to rational exponents: $\dfrac{2}{\sqrt[3]{p^2}}$.

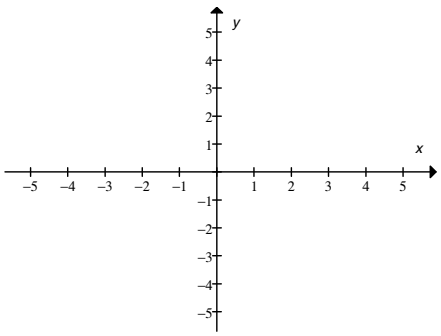
11. _____

12. Convert to radical notation: $y^{-1/2}$.

12. _____

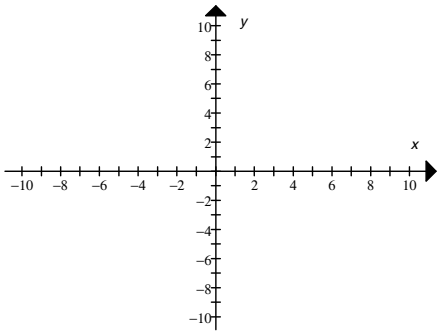
13. Graph: $f(x) = \dfrac{4}{x-4}$

13.



14. Graph: $f(x) = \dfrac{x^2+5x+6}{x+2}$

14.



Determine the following exactly.

15. $\cos(-4\pi/3)$

15. _____

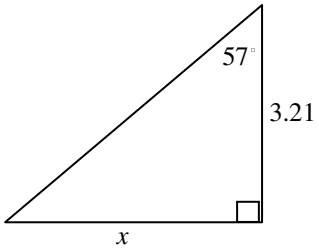
16. $\sin(\pi/6)$

16. _____

17. $\tan(-\pi)$

17. _____

18. Solve for the missing side, *x*.



18. _____

Find all values of *t* that satisfy the equation.

19. $4\sin^2 t = 1$ **19.** _____

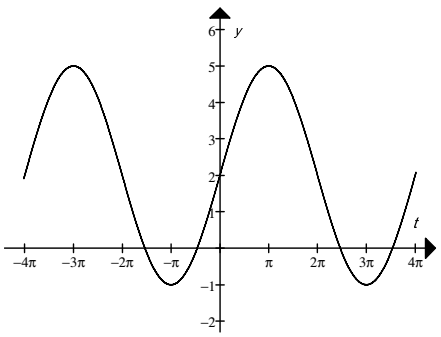
20. $2\cos^2 t + 3\cos t + 1 = 0$ **20.** _____

For each of the following functions, find the amplitude, period, and midline. Also, find the maximum and minimum

21. $y = 3\cos\left(\frac{t}{3}\right) - 2$ **21.** _____

22. $y = 2\cos(\pi t) + 3$ **22.** _____

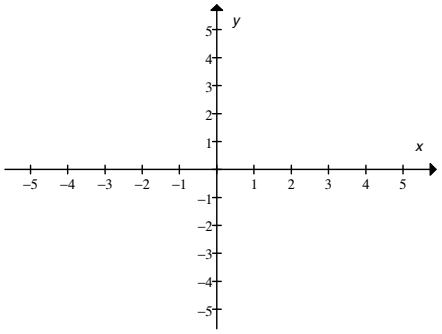
23. Determine if the graph should be modeled by either $y = a\sin bt + k$ or $y = a\cos bt + k$, Then find *a, b*, and *k*.



23. _____

24. Graph: $f(x) = \begin{cases} x^2 - 3, & \text{for } x \geq 0 \\ -2x, & \text{for } x < 0 \end{cases}$

24.



25. *Test Grades.* The following table shows the study time for a particular chapter in a calculus class and the corresponding test grade for that chapter.

Study Time (in min), t	*Test Grade (in percent), g*
40	77
60	83
120	85
200	91
300	95

(a) Using the data points (60, 83) and (300, 95) to find a linear function that fits the data. **25. (a)** _____

(b) Use the linear function to predict the test grade for a student who studies 240 min. **25. (b)** _____

---

26. Solve for x: $6x + \frac{2}{x} = -3$. **26.** _____

---

27. Use your grapher to graph: $f(x) = 2x^3 - 3x^2 + x + 2$.
Then sketch the graph below.

27.

28. Find the zeros of the function: $f(x) = \left|\sqrt[2]{2 - x^2} - 2\right|$. **28.** _____

29. *Test Grades*. Use the data in Question 25.

(a) Use the REGRESSION feature to fit a linear function to the data. **29. (a)** _____

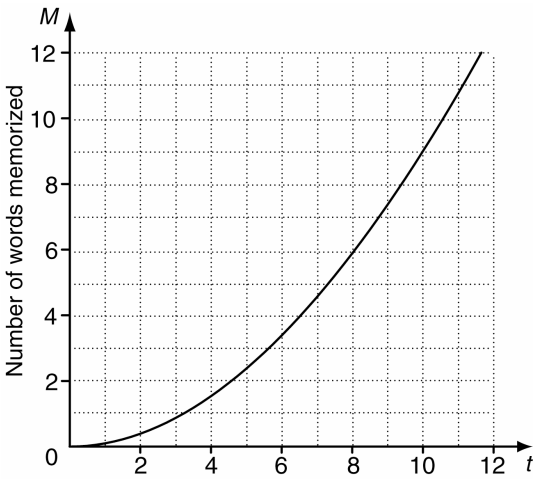
(b) Use the linear function to estimate the test grade of a student who studies 30 minutes. **29. (b)** _____

CALCULUS FOR THE LIFE SCIENCES

Name: _____

Chapter 1, Form F

1. *Memory.* The following graph relates the average number of words participants in a psychology experiment were able to memorize in a given amount of time.



Use the graph to answer the following:

(a) Estimate the number of words memorized after 10 min. **1. (a)** _____

(b) After how many minutes is the number of words memorized approximately six? **1. (b)** _____

2. A function is given by $f(x) = 3x^2 - x$. Find

(a) $f(-4)$. **2. (a)** _____

(b) $f(x+a)$. **2. (b)** _____

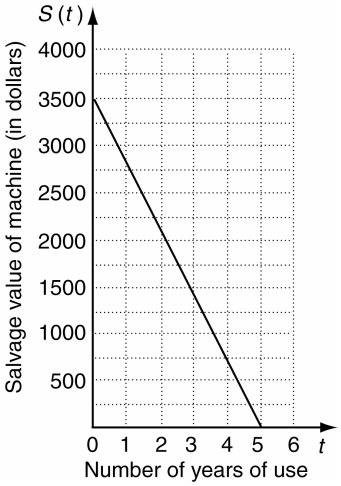
3. What are the slope and the y-intercept of $y = -2x + 3$? **3.** _____

4. Find an equation of the line with slope $-\frac{2}{3}$, containing the point $(5, -3)$. **4.** _____

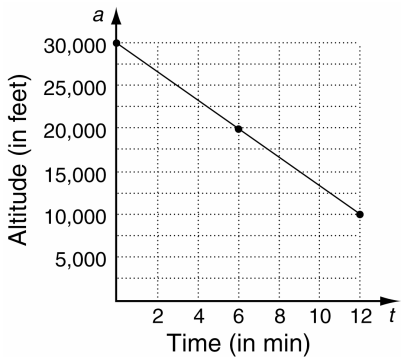
5. Find the slope of the line containing the points $(-4, -2)$ and $(3, 10)$. **5.** _____

Find the average rate of change.

6.



7.



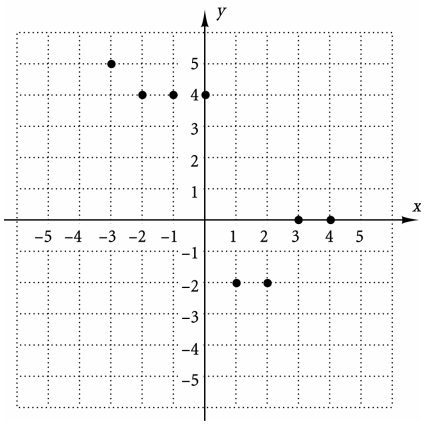
6. _____

7. _____

8. *Muscle Weight and Body Weight.* The weight M, of muscles in a human is directly proportional to the body weight W. A person who weighs 155 lb has 68 lb of muscles. Find an equation of variation expressing W as a function of M.

8. _____

9. For the following graph of function, f, determine **(a)** $f(-2)$; **(b)** the domain; **(c)** all x-values such that $f(x) = 4$; and **(d)** the range.



9.(a) _____

9.(b) _____

9.(c) _____

9.(d) _____

10. Solve for x: $x^2 - 6x + 4 = 0$.

10. _____

11. Convert to rational exponents: $\dfrac{5}{\sqrt{x}}$.

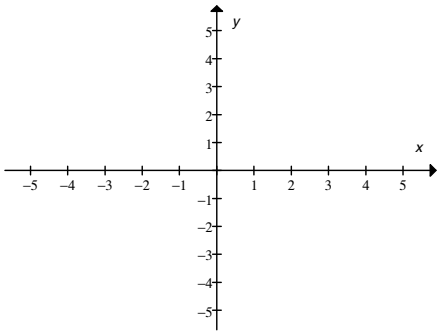
11. _____

12. Convert to radical notation: $m^{-5/4}$.

12. _____

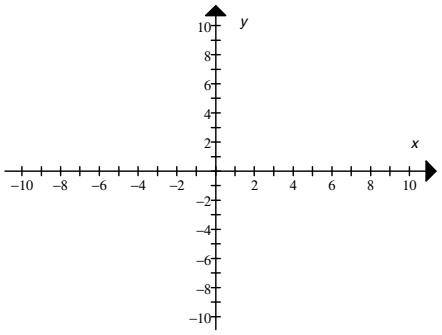
13. Graph: $f(x) = -\dfrac{2}{x}$

13.



14. Graph: $f(x) = \dfrac{x^2 + 2x - 8}{x + 4}$

14.



Determine the following exactly.

15. $\sin(2\pi/3)$

15. _____

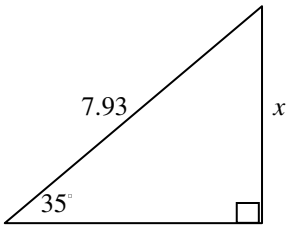
16. $\cos(11\pi/6)$

16. _____

17. $\tan(0)$

17. _____

18. Solve for the missing side, *x*.



18. _____

Find all values of *t* that satisfy the equation.

19. $4\cos^2 t = 1$ **19.** _____

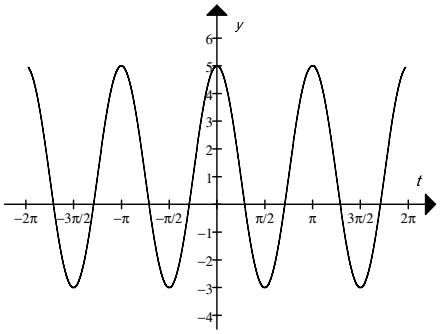
20. $2\sin^2 x + 3\sin x + 1 = 0$ **20.** _____

For each of the following functions, find the amplitude, period, and midline. Also, find the maximum and minimum

21. $y = \frac{1}{2}\sin(3t) - 3$ **21.** _____

22. $y = \sin\left(\frac{t}{2}\right) - 1$ **22.** _____

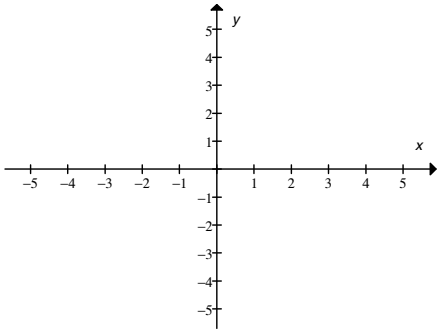
23. Determine if the graph should be modeled by either $y = a\sin bt + k$ or $y = a\cos bt + k$, Then find *a, b*, and *k*.



23. _____

24. Graph: $f(x) = \begin{cases} x^2 + 1, & \text{for } x > 0 \\ x - 2, & \text{for } x \le 0 \end{cases}$

24.



25. *Insurance Rates.* The following table shows the comparison of the cost, in dollars, of a $100,000 life insurance policy for female nonsmokers at certain ages

Age, a	*Cost, c*
31	170
32	172
33	176
34	178
35	182

(a) Using the data points (32, 172) and (35, 182) find a linear function that fits the data. **25. (a)** _____

(b) Use the linear function to predict life insurance cost for a female nonsmoker of age 38. **25. (b)** _____

---

26. Solve for x: $25x + \frac{12}{x} = 30$. **26.** _____

---

27. Use your grapher to graph: $f(x) = -x^3 + 6x - 3$.
Then sketch the graph below.

27.

28. Find the zeros of the function: $f(x) = \sqrt[3]{|10 - x^2|} - 4$. **28.** _____

29. *Insurance Rates*. Use the data in Question 25.

(a) Use the REGRESSION feature to fit a linear function to the data. **29. (a)** _____

(b) Use the linear function to estimate the life insurance cost for a female nonsmoker of age 42. **29. (b)** _____