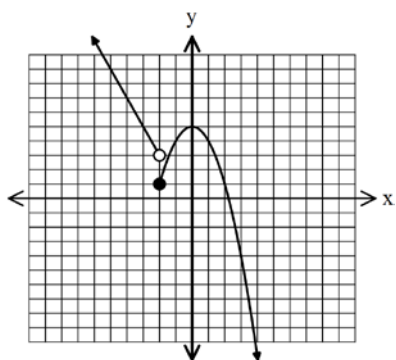Name _____

Multiple Choice: *Identify the choice that best completes the statement or answers the question.*

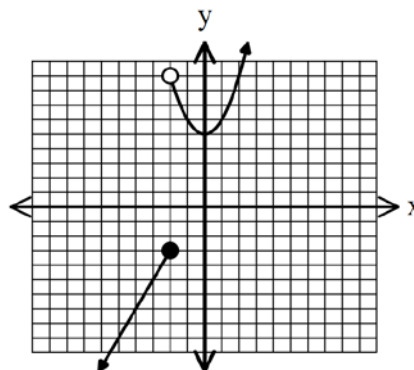1. Solve the following system to find the y-coordinates of the solution:

$$\begin{cases} y = 2x + 1 \\ y = 3x^2 + 4x - 7 \end{cases}$$

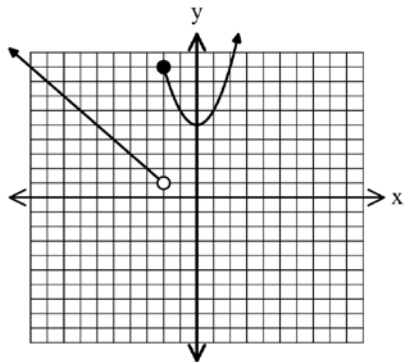2. Graph the function $f(x) = \begin{cases} 2x - 1, & x < -2 \\ -x^2 + 5, & x \geq -2 \end{cases}$

A.
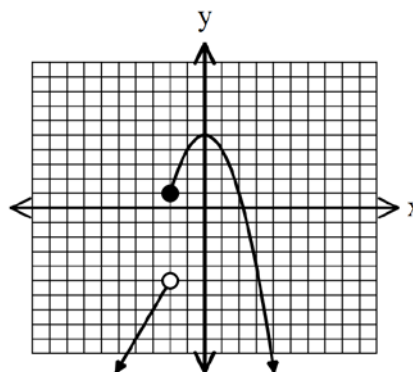

C.

B.

D.

3. Solve the following system for *z*: $\begin{cases} x + y + z = 6 \\ 3x - 2y + 4z = -3 \\ -2x + y - 3z = 1 \end{cases}$
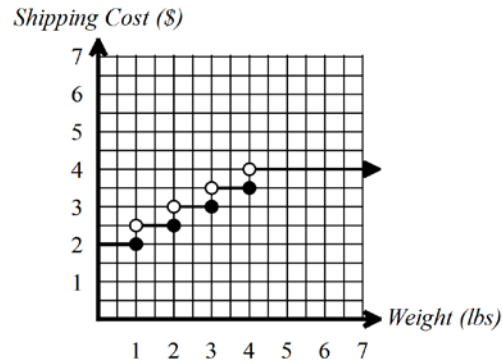
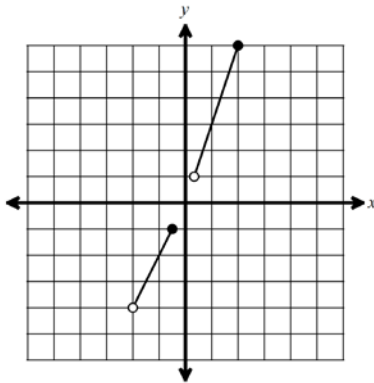A. z = -1   C. z = 1

B. z = 3   D. z = 4

4. Create a table to represent the graph:

Weight (lbs)	Shipping Cost ($)

Shipping Cost ($)

Weight (lbs)

Which of the following graphs shows a function over the domain $(-4,0] \cup [1,6)$
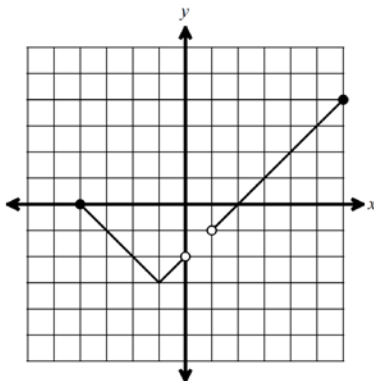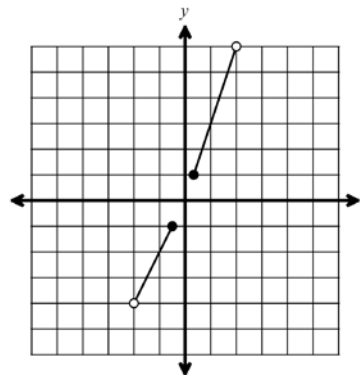
5.

A.

C.
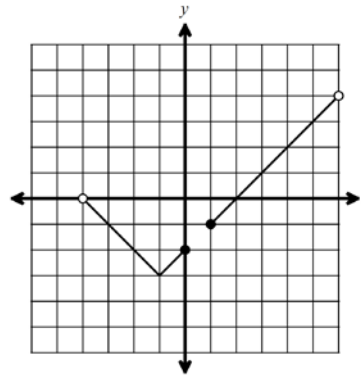
B.

D.

6. Given $f(x) = -3(x + 3.24)^2 - 6.79$, identify the domain and range of the function.

A. Domain: $(-\infty, +\infty)$
   Range: $(-\infty, -6.79]$

C. Domain: $[-\infty, +\infty]$
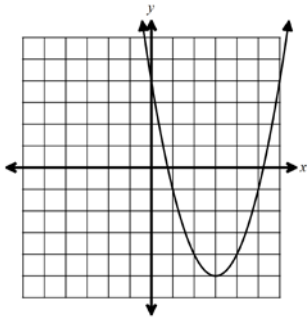   Range: $[\infty, 3.24]$

B. Domain: $(-\infty, +\infty)$
   Range: $(-\infty, -3]$

D. Domain: $(-\infty, +\infty)$
   Range: $(\infty, 3.24)$

7. Compare the two functions represented below. Determine which of the following statements is true.

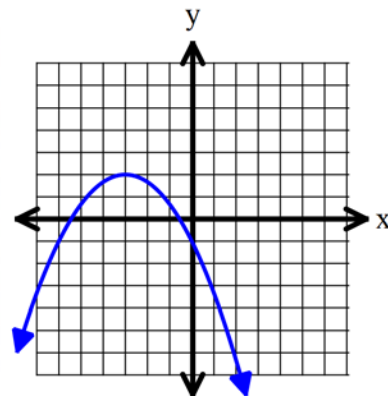| Function $f(x)$	Function $g(x)$
	$g(x) = (x - 3)^2 - 2$

A. The functions have the same vertex.

B. The minimum value of $f(x)$ is the same as the minimum value of $g(x)$.

C. The functions have the same axis of symmetry.

D. The minimum value of $f(x)$ is greater than the minimum value of $g(x)$.

8. If the function $f(x) = x^2$ is translated right ten units and down eight units, how will the domain and range of the function change?

A. The domain will become $D: \{x | x \geq 10\}$ and
   the range will become $R: \{y | y \leq -8\}$.

B. The domain will remain $D: \{x | all\ real\ numbers\}$ and
   the range will become $R: \{y | y \geq -8\}$.

C. The domain will remain $D: \{x | all\ real\ numbers\}$ and
   the range will remain $R: \{y | all\ real\ numbers\}$.

D. The domain will become $D: \{x | x \geq 10\}$ and
   the range will remain $R: \{y | all\ real\ numbers\}$.

9. Which equation is obtained after the graph below is translated 6 units to the right and 4 units down?

A. $f(x) = -\dfrac{1}{3}(x + 6)^2 - 4$

B. $f(x) = -\dfrac{1}{3}(x - 3)^2 - 2$

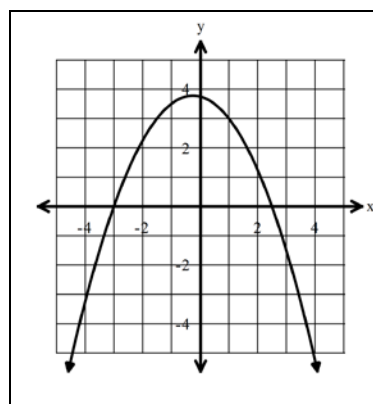C. $f(x) = -3(x + 3)^2 - 2$

D. $f(x) = -3(x - 4)^2 + 6$

10. State where the function is increasing and decreasing.

A.   Never Increasing
    Decreasing: $(-\infty, +\infty)$

B.   Increasing: $(1.5, 4) \cap (4, +\infty)$
    Decreasing: $(-\infty, -4)$

C.   Increasing: $(-\infty, -1) \cup (1.5, 4)$
    Decreasing: $(-1, 1.5), (4, \infty)$

D.   Increasing: $(-1, 1.5), (4, \infty)$
    Decreasing: $(-\infty, -1) \cup (1.5, 4)$
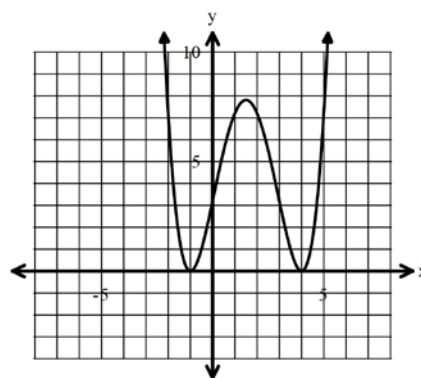
11. The function $f(x) = -x^2 - \frac{1}{2}x + \frac{15}{2}$ is graphed below. Over which intervals of x is the graph positive?

A. $(-3, 0) \cup (2.5, \infty)$

B. $(0, \infty)$

C. $(-3, 2.5)$

D. $[-3, 2.5]$

12. What are the values of the relative maxima and/or minima of the function graphed?
    Choose all that apply:

A. relative maxima: $-5, 5$

B. relative minima: 0

C. relative maxima: $9, 13$

D.   relative minima: *none*

E. relative maxima: *none*

F. relative minima: -4

G. relative maxima: $-5, -9$

H. relative minima: $0, -4$
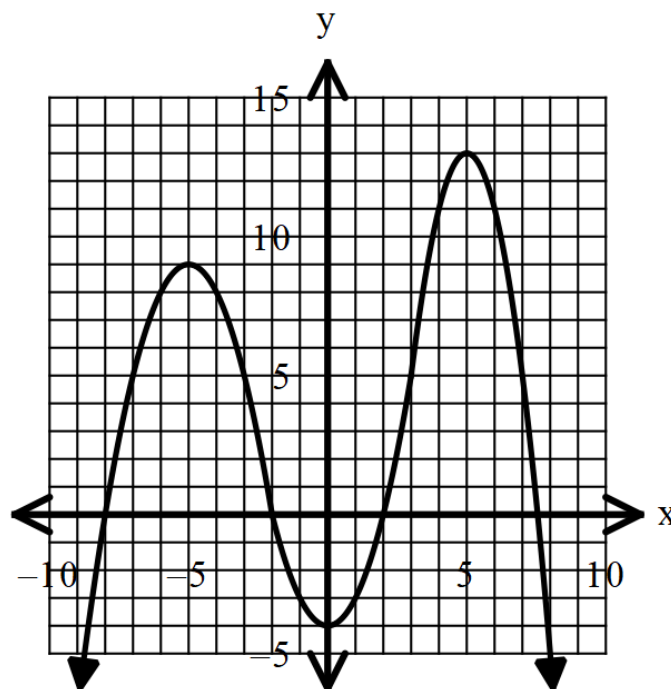
13. Solve: $2(x+2)^2 = 80$

    a. $x = \pm\sqrt{38}$
    b. $x = -4\sqrt{10}$ or $\sqrt{10}$
    c. $x = -2 \pm 2\sqrt{10}$
    d. $x = \pm\sqrt{10}$

14. Simplify $3i(9+i) - 4(3-2i)$

15. Simplify $\left(\sqrt{3}+6i\right)^2$

16. Simplify $\left(i\sqrt{5}+9\right)\left(i\sqrt{5}-9\right)$

17. Simplify $\dfrac{3i(5+3i)}{4+4i}$

18. Write $\dfrac{5i(4+2i)-6}{2i}$ as a complex number in standard form.

19. What are the x-coordinates of the points of intersection given the system below?

$$\begin{cases} x^2 - 10x + 5y + 7 = 0 \\ \quad -3x + y = -1 \end{cases}$$

20. What are the solutions to the quadratic equation, $5x^2 + 14x = 2x - 40$?

21. Given $f(x) = \frac{1}{2}x^2 - 2x + 11$, find the value of k if the function is written in vertex form, $f(x) = a(x - h)^2 + k$.

A. $k = 9$

B. $k = 7$

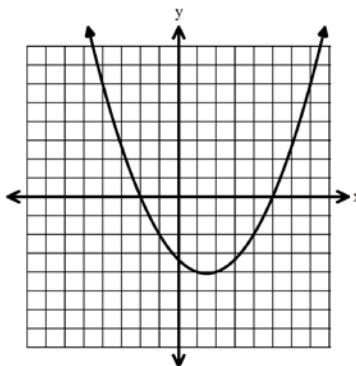C. $k = \dfrac{87}{8}$

D. $k = 11$

22. Which function is represented by the graph?

A. $f(x) = \dfrac{1}{3}(x - 5)(x - 6)$

B. $f(x) = (x + 5)(x + 2)$

C. $f(x) = (x - 5)(x - 6)$

D. $f(x) = \dfrac{1}{3}(x - 5)(x + 2)$

23. Which of following functions does **not** represent a parabola with an x-intercept at $(-2, 0)$?

A. $f(x) = \dfrac{1}{4}x^2 - x - 3$

B. $f(x) = x^2 + 13x + 22$

C. $f(x) = -(x + 5)^2 + 9$

D. $f(x) = 2(x + 3)^2 - 8$

24. Compare the axis of symmetry and the minimum values for the two functions below.

$$h(x) = 2(x + 3)(x - 7)$$

$$j(x) = x^2 - 4x - 21$$

Determine which of the following statements is correct.

A. The functions $h(x)$ and $j(x)$ have the same axis of symmetry, but the minimum value of $h(x)$ is less than the minimum value of $j(x)$.

B. The functions $h(x)$ and $j(x)$ have the same axis of symmetry, but the minimum value of $h(x)$ is greater than the minimum value of $j(x)$.

C. The functions $h(x)$ and $j(x)$ do not have the same axis of symmetry, and the minimum value of $h(x)$ is less than the minimum value of $j(x)$.

D. The functions $h(x)$ and $j(x)$ do not have the same axis of symmetry, and the minimum value of $h(x)$ is greater than the minimum value of $j(x)$.

25. Lyndsey and her best friend Mara are at their favorite clothing store and wanted to buy some jeans, dresses and shoes.

Jeans, dresses, shoes	10 items bought
Jeans cost $25, dresses cost $50 and shoes cost $20	Spent $260 total
They want to buy twice as many jeans as they do shoes	

How many of each item can Lyndsey and Mara buy?

26. Which of the following systems of equations could a student use to write a quadratic function in standard form for the parabola passing through the points (-3, -4), (6, 5) and (-1, 12)?
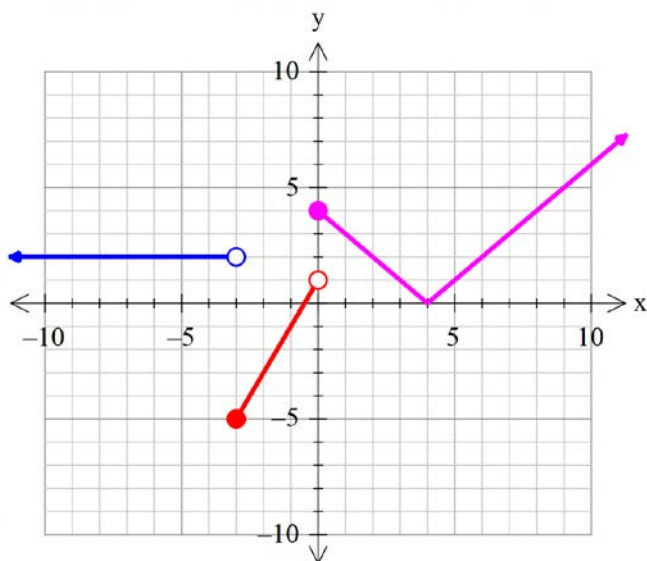
A. $\begin{cases} 9a - 3b + c = -4 \\ 36a + 6b + c = 5 \\ a - b + c = 12 \end{cases}$

C. $\begin{cases} 9a - 4b + c = y \\ 36a + 5b + c = y \\ a + 12b + c = y \end{cases}$

B. $\begin{cases} -6a - 3b + c = -4 \\ 12a + 6b + c = 5 \\ -2a - b + c = 12 \end{cases}$

D. $\begin{cases} -3x^2 - 4x + c = y \\ 6x^2 + 5x + c = y \\ -x^2 + 12b + c = y \end{cases}$

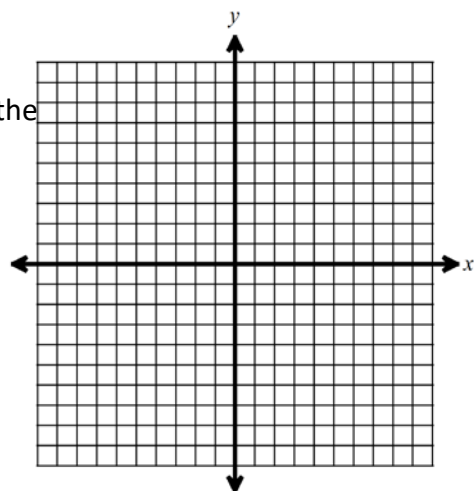27. Write the piecewise function for the graph below:

28. Multiply: $(3x^2 - 5x + 2)(-x^2 + 4x + 7)$

29. Sketch the graphs of $f(x)$ and $g(x)$ on the same coordinate plane given the following information:
- $f(x)$ has zeros at $-1, 4, 8$
- As $x \to -\infty$, $f(x) \to +\infty$ and as $x \to +\infty$, $f(x) \to -\infty$
- $f(x)$ has a local maxima at approximately $(6, 3)$ and a local minima at approximately $(1, -4)$
- $g(x) = 2x + 1$

How many real solutions exist when $f(x) = g(x)$?

30. Factor: $9x^4 - 40x^2 + 16$

31. Factor: $64x^3 - 125$

32. Factor the following using imaginary numbers: $4x^2 + 121$

A. $(2x - 11)(2x + 11)$

C. $\left(2x + i\sqrt{11}\right)^2$

B. $(2x - 11i)(2x + 11i)$

D. $(2x + 11i)(2x + 11i)$

33. Solve: $12y^3 - 5y^2 - 3y = -16y^3 - 22y^2$

34. Solve: $x^4 - 144 = 0$

35. What is the remainder in the division $(5x^3 - 3x^2 + 4x - 8) \div (x - 3)$

36. Find the quotient of $(5x^3 - 35x + 4) \div (x - 2)$

37. A function has the end behavior, as $x \to -\infty$, $f(x) \to +\infty$ and as $x \to +\infty$, $f(x) \to -\infty$. Which of the following polynomials could be the function?
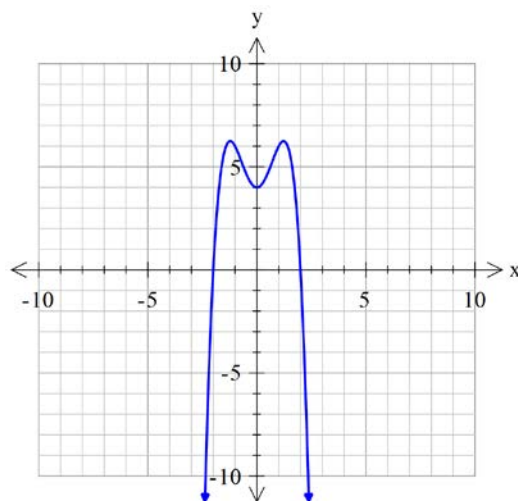
   A. $f(x) = (x^7 + 3x + 5)(-7x^5 + 4x^2)$

   B. $f(x) = 3x^4 + 2x^2 - 11$

   C. $f(x) = (x^3 - 2x)(-4x^8 + 6x^7 - 4)$

   D. $f(x) = 11x^5 - 4x^3 + 7x - 6$

38. The equation $-x^4 + 3x^2 + 4 = f(x)$ is graphed below. Use the graph to help solve the equation and find all the roots of the function.
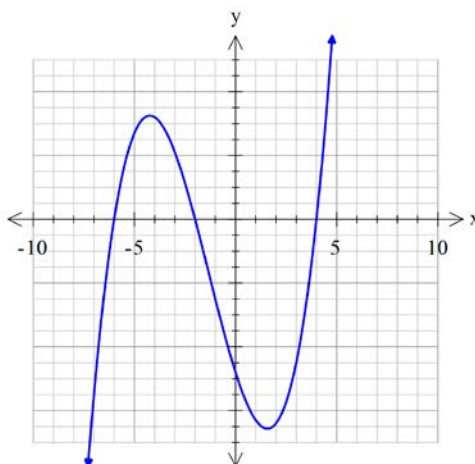

39. Which of the following functions has the same end behavior as the function below?

   A. f(x) = -6x+3

   B. f(x) = x^2 +3x-7

   C. f(x) = $|x + 2| + 1$

   D. f(x) = $4x^5$-3x+2

40. Find all of the zeros of $f(x) = x^3 + 3x^2 + x - 5$.

41. Write the simplest polynomial function with zeros $-2i, 5, \sqrt{3}$.

A. $f(x) = x^3 - 6x^2 - x + 30$

B. $f(x) = x^5 - 5x^4 + x^3 - 5x^2 - 12x + 60$
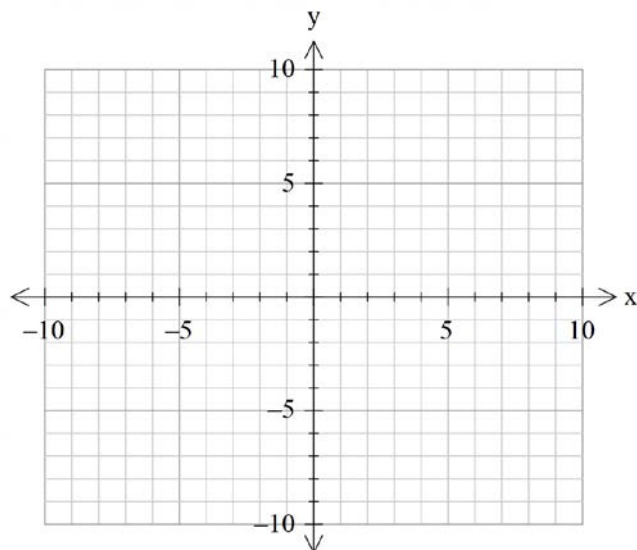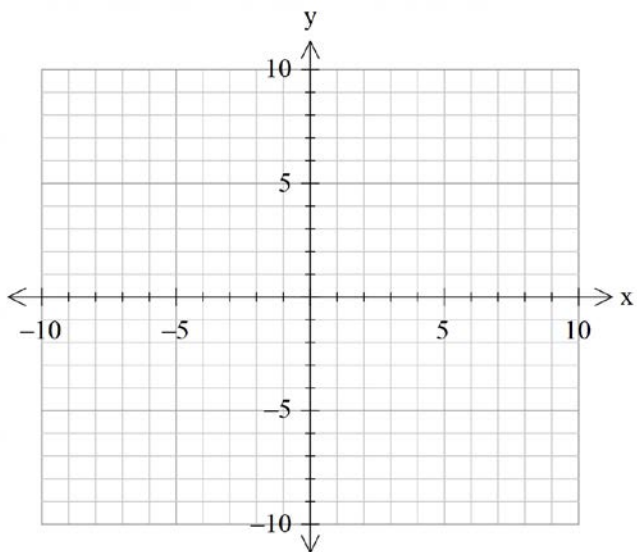
C. $f(x) = x^6 - 24x^4 - 37x^2 - 54x + 30$

D. $f(x) = x^5 - 5x^4 - 5x^3 + 25x^2 - 36x + 180$

42. Solve: $4(x + 3)^2 = 140$

43. Let $f(x) = -3(x + 3)^2$ and $g(x) = 5(x - 2)^2$. What is $f(x) - g(x)$?

44. Graph the system: $\begin{cases} y \geq 2(x + 3)^2 - 5 \\ y < \frac{1}{2}x + 3 \end{cases}$

45. Graph the system: $\begin{cases} y > -(x + 3)^2 + 2 \\ y \geq -x - 5 \end{cases}$

46. The tables below list the average rates of change over different intervals for two functions.

f(x)	
Interval	Rate of Change
[−4, −3]	−3
[−3, −2]	−1
[-2, 0]	2

g(x)	
Interval	Rate of Change
[−4, −3]	0
[−3, −2]	0
[-2, 0]	0

Which of the following statements must be true? Select all that apply:

A. $g(x)$ could be a quadratic function over the interval $[-4, 0]$.

B. $f(x)$ could be a linear function over the interval $[-4, 0]$.

C. $g(x)$ could be a constant function over the interval $[-4, 0]$.

D. $f(x)$ could be a quadratic function over the interval $[-4, 0]$.

Answers:

1) $y = -3, \frac{11}{3}$ 2) D   3) A   4)

5) C   6) A   7) C   8) B

9) B   10) D   11) C   12) C, F   13) C

14) $-15 + 35i$ 15) $-33 + 12i\sqrt{3}$

16) -86

17) $\frac{3+12i}{4}$ or $\frac{3}{4} + 3i$ 18) $10 + 8i$

19) $\frac{-5\pm\sqrt{17}}{2}$ 20) $\frac{-6\pm2i\sqrt{41}}{5}$

Weight (lbs)	Shipping Cost ($)
$0 < x \le 1.0$	2.00
$1.0 < x \le 2.0$	2.50
$2.0 < x \le 3.0$	3.00
$3.0 < x \le 4.0$	3.50
$x > 4.0$	4.00

21) A   22) D   23) D   24) A   25) 6 jeans, 1 Dress, 3 shoes

26) A   27) $\begin{cases} y = 2, \ x < -3 \\ y = 2x + 1, \ -3 \le x < 0 \\ y = |x - 4|, \ x \ge 0 \end{cases}$

28) $-3x^4 + 17x^3 - x^2 - 27x + 14$

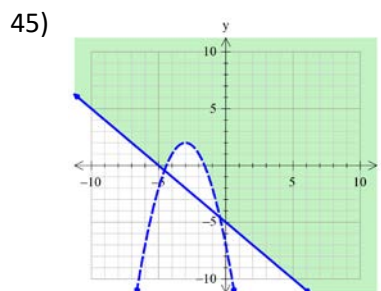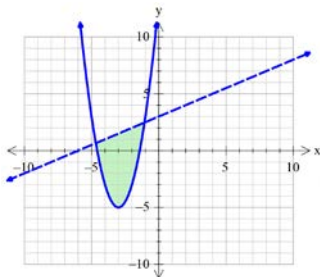29) one solution   30) $(3x - 2)(3x + 2)(x + 2)(x - 2)$

31) $(4x - 5)(16x^2 + 20x + 25)$ 32) B   33) $y = 0, \frac{1}{7}, -\frac{3}{4}$

34) $x = \pm2\sqrt{3}, x = \pm2i\sqrt{3}$ 35) 112   36) $5x^2 + 10x - 15 - \frac{26}{x-2}$

37) C   38) $x = \pm2, \pm i$ 39) D   40) $x = 1, -2 \pm i$ 41) B

42) x= $-3\pm\sqrt{35}$ 44)   45)

43) $-8x^2 + 2x - 47$

46) C, D