1. Which of the following expressions is equivalent to $(3-5b)^2$?

(A) $9-25b^2$
(B) $9+25b^2$
(C) $9-15b-25b^2$
(D) $9+30b-25b^2$
(E) $9-30b+25b^2$

5. Where defined $\dfrac{\dfrac{x^2-9}{x+2}}{\dfrac{x-3}{x-2}} =$

(A) $\dfrac{x-2}{x+2}$

(B) $\dfrac{(x-2)(x+3)}{x+2}$

(C) $\dfrac{x^2-x+6}{x+2}$

(D) $\dfrac{1}{(x-2)(x+2)}$

(E) $\dfrac{x+3}{(x-2)(x+2)}$

6. Which of the following are solutions of the equation $(2x-3)(3x+5) = -14$?

(A) $x = \dfrac{1}{3}$ and $x = -\dfrac{1}{2}$
(B) $x = -\dfrac{1}{3}$ and $x = \dfrac{1}{2}$
(C) $x = \dfrac{3}{2}$ and $x = -\dfrac{5}{3}$
(D) $x = -\dfrac{3}{2}$ and $x = \dfrac{5}{3}$
(E) $x = 2$ and $x = -7$

9. Which of the following is equal to $r^2t^{1/2}r^{2/3}t^{-3/2}$?

(A) $-r^{8/3}t$

(B) $\dfrac{r^{4/3}}{t^{3/4}}$

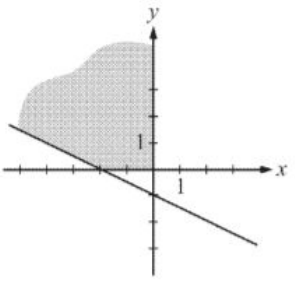
(C) $\dfrac{r^{4/3}}{t}$

(D) $\dfrac{r^{5/2}}{t^{5/6}}$

(E) $\dfrac{r^{8/3}}{t}$

13. Which of the following are the solutions of the equation $2x^2+2x = 4-x$?

(A) $x = 4$ and $x = 1$
(B) $x = 4$ and $x = -\dfrac{1}{2}$
(C) $x = \dfrac{3+\sqrt{35}}{4}$ and $x = \dfrac{3-\sqrt{35}}{4}$
(D) $x = \dfrac{-3+\sqrt{41}}{4}$ and $x = \dfrac{-3-\sqrt{41}}{4}$
(E) $x = \dfrac{-3+i\sqrt{23}}{2}$ and $x = \dfrac{-3-i\sqrt{23}}{2}$



17. Which quadrants of the xy-plane contain points of the graph of $2x-y>4$?

(A) I, II, and III only
(B) I, II, and IV only
(C) I, III, and IV only
(D) II, III, and IV only
(E) I, II, III, and IV

21. When $\dfrac{3+4i}{2+i}$ is expressed in the form $a+bi$, what is the value of a?

25. Indicate whether each statement is always true, never true, or sometimes true for the real numbers a and b.

Statement	Always True	Never True	Sometimes True
$\|a+b\| = \|a\| + \|b\|$			
$\|a+b\| < \|a\| + \|b\|$			
$\|a+b\| \le \|a\| + \|b\|$			
$\|a+b\| > \|a\| + \|b\|$			

29. If $x=-3$ is a root of the equation $x^3+3x^2-ax-12=0$, what is the value of a?

33. In the xy-plane, what is the x-intercept of the graph of $y=-\frac{2}{3}x-4$?

37. Let f be a linear function. When $f(x)$ is divided by $x-3$, the remainder is 5. When $f(x)$ is divided by $x-4$, the remainder is 3. What is the value of $f(0)$?

(A) 2
(B) 5
(C) 8
(D) 11
(E) 15

41. If $f(x)=5-2x^3$ and f^{-1} denotes the inverse function of f, then $f^{-1}(x)=$

(A) $\sqrt[3]{\frac{5-x}{2}}$
(B) $\frac{\sqrt[3]{5-x}}{2}$
(C) $\sqrt[3]{\frac{x-5}{2}}$
(D) $\frac{1}{5-2x^3}$
(E) $5x^3+2$

45. The population of a small town is modeled by an exponential function of the form $p(t)=ab^t$, where t represents the number of years since 2010. The population of the town was recorded as 425 in 2010 and 612 in 2012. Based on the data for the years 2010 and 2012, what is the value of b in the model?

49. The function f above has an inverse function for which of the following values of a and b?

(A) $a=-1,\ b=-2$
(B) $a=-1,\ b=2$
(C) $a=0,\ b=-1$
(D) $a=1,\ b=-2$
(E) $a=1,\ b=2$

53. If b and c are integers such that the equation $3x^2+bx+c=0$ has only one real root, which of the following statements must be true?

I. b is even.
II. c is odd.
III. b^2 is a multiple of 3.

(A) I only
(B) III only
(C) I and II only
(D) I and III only
(E) I, II, and III

57. The polynomial $p(x)=x^3+2x-11$ has a real zero between which two consecutive integers?

(A) 0 and 1
(B) 1 and 2
(C) 2 and 3
(D) 3 and 4
(E) 4 and 5

61. The function f is defined for all real numbers x by $f(x)=ax^2+bx+c$, where a, b, and c are constants and a is negative. In the xy-plane, the x-coordinate of the vertex of the parabola $y=f(x)$ is -1. If t is a number for which $f(t)>f(0)$, which of the following must be true?

I. $-2<t<0$
II. $f(t)<f(-2)$
III. $f(t)>f(1)$

(A) I only
(B) II only
(C) I and III only
(D) II and III only
(E) I, II, and III

65. What is the remainder when the polynomial $9x^{23}-7x^{12}-2x^5+1$ is divided by $x+1$?

(A) -19
(B) -13
(C) -7
(D) 1
(E) 11

69. $C(x)=1200+1000x$
$R(x)=1200x-x^2$

For a certain company, the functions shown above model the cost C of producing x units of a product and the revenue R from selling x units of the same product. The profit function P is equal to $R-C$. Which of the following defines the function P?

(A) $P(x)=x^2-200x+1200$
(B) $P(x)=x^2+200x-1200$
(C) $P(x)=-x^2+200x-1200$
(D) $P(x)=-x^2+2200x-1200$
(E) $P(x)=-x^2+2200x+1200$

73. The function f is defined by $f(x)=x^2+3$. Which of the following is equal to $f(x+5)$?

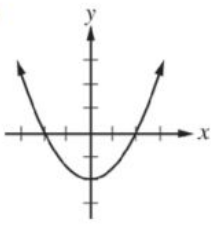
(A) x^2+8
(B) x^2+28
(C) x^2+5x+8
(D) $x^2+10x+8$
(E) $x^2+10x+28$

77. The owner of a small restaurant earned a profit of \$300 during the first month of operation. According to the business model for the next 12 months, it is projected that the profit for each month after the first will be \$50 more than the profit for the preceding month. If $p(m)$ represents the profit for each month m and $m=1$ represents the first month, which of the following functions describes the business model?

(A) $p(m)=m+50$
(B) $p(m)=m+300$
(C) $p(m)=50m+250$
(D) $p(m)=50m+300$
(E) $p(m)=300m+50$

81. Which of the following graphs in the xy-plane represent y as a function of x?

Indicate <u>all</u> such graphs.

(A)


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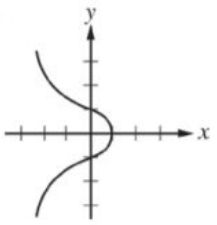

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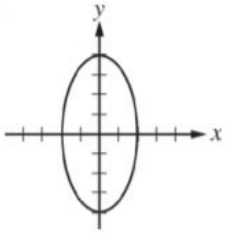

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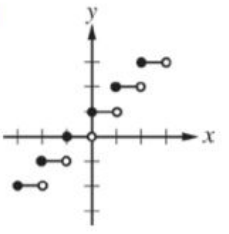

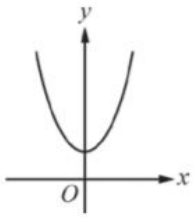

85. The graph of a quadratic function $y = f(x)$ is shown in the xy-plane. Which of the following statements about f must be true?

Indicate <u>all</u> such statements.

(A) f has no real roots.

(B) f has a positive leading coefficient.

(C) The domain and range of f are all real numbers.

89. Which of the following is equivalent to $3y - 6xy - 12x^2y$?

(A) $-3y(4x^2 + 2x - 1)$

(B) $-3y(4x^2 - 2x - 1)$

(C) $-3y(4x^2 + 2x + 1)$

(D) $3y(-4x^2 - 2x)$

(E) $3y(4x^2 + 2x)$