

Part I: Multiple Choice. Place the correct answer on the line provided.




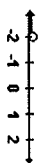
_____ 1. What is the *negative* value of x that satisfies the equation $2x^2 + 5x - 3 = 0$?

1. -1
 2. $-\frac{1}{2}$
 3. -3
 4. $-\frac{2}{3}$

_____ 2. What are the roots of the equation $x^2 - 5x - 2 = 0$?

1. $x = \frac{5 \pm \sqrt{17}}{2}$
 2. $x = \frac{5 \pm \sqrt{33}}{2}$
 3. $x = \frac{-5 \pm \sqrt{17}}{2}$
 4. $x = \frac{-5 \pm \sqrt{33}}{2}$

_____ 3. Which graph represents the inequality $x^2 - 4 > 0$?

1. 
 2. 
 3. 
 4. 

_____ 4. Solve the equation $8x^3 + 4x^2 - 18x - 9 = 0$ algebraically for all values of x .

1. $\frac{3}{2}$ and $\frac{1}{2}$
 2. $\frac{3}{2}$ and $-\frac{1}{2}$
 3. $\pm \frac{3}{2}$ and $-\frac{1}{2}$
 4. $\pm \frac{3}{2}$ and $\frac{1}{2}$

_____ 5. If $x^2 + 2 = 6x$ is solved by completing the square, an intermediate step would be

1. $(x + 3)^2 = 7$
 2. $(x - 3)^2 = 7$
 3. $(x - 3)^2 = 11$
 4. $(x - 6)^2 = 34$

_____ 6. When the expression $(x + 2)^2 + 4(x + 2) + 3$ is rewritten as the product of two binomials, the result is

1. $(x + 3)(x + 1)$
 2. $(x + 5)(x + 3)$
 3. $(x + 2)(x + 2)$
 4. $(x + 6)(x + 1)$

_____ 7. The expression $x(3x)^3 + 2x^2$ is equivalent to

1. $2x + 27x^4$
 2. $-7x$
 3. $-25x$
 4. $-29x$

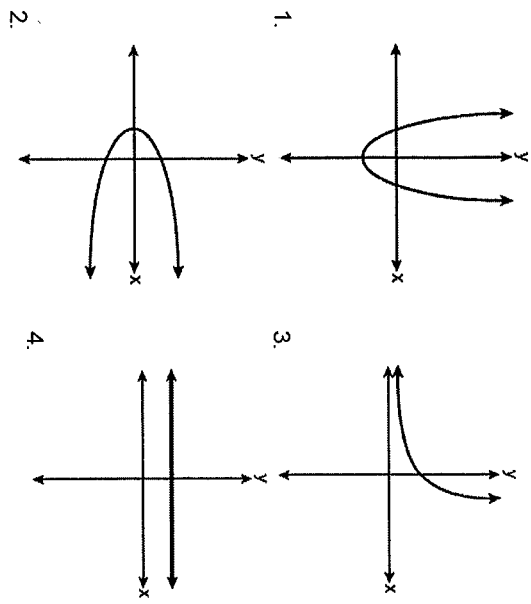
_____ 8. If $f(x) = 2x^2 - 3x + 1$ and $g(x) = x + 5$, what is $f(g(x))$?

1. $2x^2 + 17x + 36$
 2. $2x^2 + 17x + 66$
 3. $2x^2 - 3x + 6$
 4. $2x^2 - 3x + 36$
 5.

_____ 9. What is the inverse of the function $f(x) = \frac{11+3x}{x}$?

1. $f^{-1}(x) = \frac{-11}{x-3}$
 2. $f^{-1}(x) = \frac{11}{x-3}$
 3. $f^{-1}(x) = \frac{-11}{x+3}$
 4. $f^{-1}(x) = \frac{11}{x+3}$

10. Which graph represents a one-to-one function?



13. If the vertex of a parabola is (-6,6) and the directrix is $y = -4$ what is the equation of the parabola?

14. Algebraically, solve the system of equations:

$$\begin{aligned} (x - 1)^2 + (y - 2)^2 &= 9 \\ y - x &= 4 \end{aligned}$$

15. Solve for the roots in simplest $a + bi$ form.

$$\frac{x-2}{2} = \frac{x-4}{x}$$

PART II: Short Answer: Show all work!

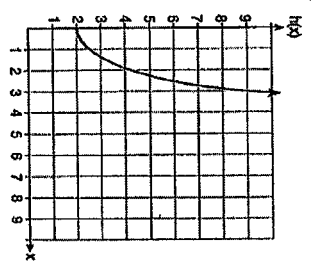
11. Use the discriminant to determine all values of k that would result in the equation $x^2 - kx + 4 = 0$ having equal roots.

16. Given the functions $f(x)$, $g(x)$ and $h(x)$ shown below:

$$g(x) = x^2 + 4x$$

x	f(x)
-2	-5
0	3
2	11
3	15

Order from greatest to least by average rate of change over the interval $0 \leq x \leq 3$.



12. Solve for x : $x + \sqrt{x-2} = 2$

Part I: Multiple Choice. Place the correct answer on the line provided.

3. 1. What is the negative value of x that satisfies the equation $2x^2 + 5x - 3 = 0$?
 1. -1
 2. $-\frac{1}{2}$
 3. -3
 4. $-\frac{2}{3}$

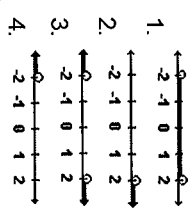
$(2x+6)(x-1) = 0$
 $2x+6 = 0 \rightarrow x = -3$
 $x-1 = 0 \rightarrow x = 1$
 Answer: $x = -3$

2. What are the roots of the equation $x^2 - 5x - 2 = 0$?

1. $x = \frac{5 \pm \sqrt{17}}{2}$
 2. $x = \frac{5 \pm \sqrt{33}}{2}$
 3. $x = \frac{-5 \pm \sqrt{17}}{2}$
 4. $x = \frac{-5 \pm \sqrt{33}}{2}$

$x = \frac{5 \pm \sqrt{(-5)^2 - 4(1)(-2)}}{2(1)}$
 $x = \frac{5 \pm \sqrt{33}}{2}$

3. Which graph represents the inequality $x^2 - 4 > 0$?



4. Solve the equation $8x^3 + 4x^2 - 18x - 9 = 0$ algebraically for all values of x .

1. $\frac{3}{2}$ and $\frac{1}{2}$
 2. $\frac{3}{2}$ and $-\frac{1}{2}$
 3. $\pm \frac{3}{2}$ and $-\frac{1}{2}$
 4. ± 2 and 2

$4x^2(2x+1) - 9(2x+1) = 0$
 $(4x^2 - 9)(2x+1) = 0$
 $(2x+3)(2x-3)(2x+1) = 0$
 $x = -\frac{3}{2} \quad x = \frac{3}{2} \quad x = -\frac{1}{2}$

5. If $x^2 + 2 = 6x$ is solved by completing the square, an intermediate step would be

1. $(x+3)^2 = 7$
 2. $(x-3)^2 = 7$
 3. $(x-3)^2 = 11$
 4. $(x-6)^2 = 34$

$x^2 - 6x + 9 = 9$
 $(x-3)^2 - 9 = 9$
 $(x-3)^2 = 18$
 $(x-3)^2 = 9$

6. When the expression $(x+2)^2 + 4(x+2) + 3$ is rewritten as the product of two binomials, the result is

1. $(x+3)(x+1)$
 2. $(x+5)(x+3)$
 3. $(x+2)(x+2)$
 4. $(x+6)(x+1)$

$(x+2)(x+2) + 4(x+2) + 3$
 $x^2 + 4x + 4 + 4x + 8 + 3$
 $x^2 + 8x + 15$

7. The expression $x(3x)^3 + 2x^{12}$ is equivalent to

1. $2x + 27x^4$
 2. $-7x$
 3. $-25x$
 4. $-29x$

$x(3^3 x^3) + 2x^{12}$
 $x(27x^3) + 2x^{12}$
 $27x^4 + 2x^{12}$

8. If $f(x) = 2x^2 - 3x + 1$ and $g(x) = x + 5$, what is $f(g(x))$?

1. $2x^2 + 17x + 36$
 2. $2x^2 + 17x + 66$
 3. $2x^2 - 3x + 6$
 4. $2x^2 - 3x + 36$
 5. _____

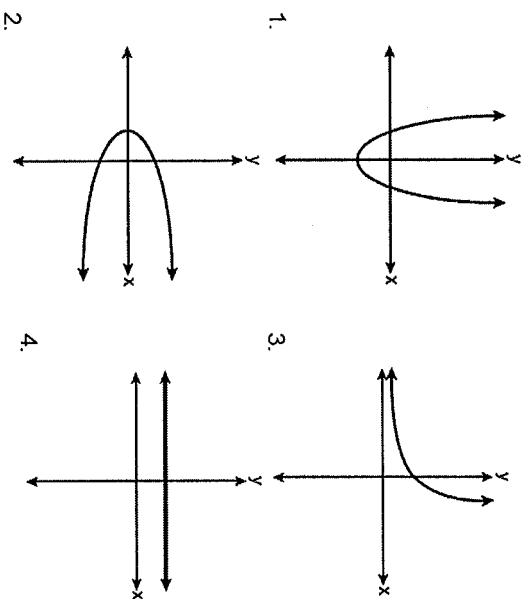
$2(x+5)^2 - 3(x+5) + 1$
 $2(x^2 + 10x + 25) - 3x - 15 + 1$
 $2x^2 + 20x + 50 - 3x - 14$

9. What is the inverse of the function $f(x) = \frac{11+3x}{x}$?

1. $f^{-1}(x) = \frac{-11}{x-3}$
 2. $f^{-1}(x) = \frac{11}{x-3}$
 3. $f^{-1}(x) = \frac{-11}{x+3}$
 4. $f^{-1}(x) = \frac{11}{x+3}$

$f(x) = \frac{11+3x}{x} \rightarrow x = \frac{11+3y}{y}$
 $xy = 11 + 3y$
 $xy - 3y = 11$
 $y(x-3) = 11$
 $y = \frac{11}{x-3}$

3 10. Which graph represents a one-to-one function?



PART II: Short Answer: Show all work!

11. Use the discriminant to determine all values of k that would result in the equation $x^2 - kx + 4 = 0$ having equal roots.

$$b^2 - 4ac = 0$$

$$(-k)^2 - 4(1)(4) = 0$$

$$k^2 - 16 = 0$$

$$(k+4)(k-4) = 0$$

$$k = -4 \quad | \quad k = 4$$

12. Solve for x : $x + \sqrt{x-2} = 2$

$$x + \sqrt{x-2} = 2$$

$$-\sqrt{x-2} = 2-x$$

$$(\sqrt{x-2})^2 = (2-x)^2$$

$$x-2 = (2-x)(2-x)$$

$$x-2 = 4-2x-2x+x^2$$

$$x-2 = 4-4x+x^2$$

$$-x+x+4x-2 = x^2-4x+6$$

$$0 = x^2-5x+6$$

$$0 = (x-3)(x-2)$$

$$x = 3 \quad | \quad x = 2$$

13. If the vertex of a parabola is $(-6, 6)$ and the directrix is $y = -4$ what is the equation of the parabola?

$$y = \frac{1}{4p}(x-h)^2 + k$$

$$p = 10$$

$$y = \frac{1}{40}(x+6)^2 + 6$$

14. Algebraically, solve the system of equations: $x^2 + y - x = 4$ and $y = x + 4$

$$x^2 + y - x = 4$$

$$y = x + 4$$

$$x^2 + (x+4) - x = 4$$

$$x^2 + x + 4 - x = 4$$

$$x^2 = 0$$

$$x = 0$$

$$y = 0 + 4 = 4$$

$$(0, 4)$$

15. Solve for the roots in simplest $a + bi$ form.

$$\frac{x-2}{2} = \frac{x-4}{x}$$

$$x(x-2) = 2(x-4)$$

$$x^2 - 2x = 2x - 8$$

$$x^2 - 4x + 8 = 0$$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(8)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{16 - 32}}{2} = \frac{4 \pm \sqrt{-16}}{2} = \frac{4 \pm 4i}{2} = 2 \pm 2i$$

16. Given the functions $f(x)$, $g(x)$ and $h(x)$ shown below:

$g(x) = x^2 + 4x$

x	$f(x)$
-2	-5
0	3
2	11
3	15

$m = \frac{15-3}{3-0} = \frac{12}{3} = 4$

Order from greatest to least by average rate of change over the interval $0 \leq x \leq 3$.

$g(x), f(x), h(x)$

