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(a) (b) (c) (d) (e)

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GOOD LUCK!

3. (a) (b) (c) (d) (e)   12. (a) (b) (c) (d) (e)

4. (a) (b) (c) (d) (e)   13. (a) (b) (c) (d) (e)

5. (a) (b) (c) (d) (e)   14. (a) (b) (c) (d) (e)

6. (a) (b) (c) (d) (e)   15. (a) (b) (c) (d) (e)

7. (a) (b) (c) (d) (e)   16. (a) (b) (c) (d) (e)

8. (a) (b) (c) (d) (e)   17. (a) (b) (c) (d) (e)

9. (a) (b) (c) (d) (e)   18. (a) (b) (c) (d) (e)

10. (a) (b) (c) (d) (e)   19. (a) (b) (c) (d) (e)

11. (a) (b) (c) (d) (e)   20. (a) (b) (c) (d) (e)

For grading use:

Multiple Choice	Short Answer
(number right) (5 points each)	(out of 10 points)

Total	
	(out of 100 points)

Short Answer Questions

Each question is an opportunity to earn 5 points. Points are earned on the clarity and correctness of your explanation, not merely on having a correct answer somewhere.

1. Write the equation of the line in Slope-Intercept form that contains the two points P=(10,3) and Q=(7,1).

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{1-3}{7-10} = \dfrac{-2}{-3} = \dfrac{2}{3}$

$y = mx + b$

$y = \dfrac{2}{3}x + b$

Use either point to find b.

$7 = \dfrac{2}{3} \cdot 1 + b$

$b = 7 - \dfrac{2}{3} = \dfrac{19}{3}$

$\Rightarrow \boxed{y = \dfrac{2}{3}x + \dfrac{19}{3}}$

You can also use point-slope form.

$y - y_1 = m(x - x_1)$

$y - 7 = \dfrac{2}{3}(x-1)$

$y - 7 = \dfrac{2}{3}x - \dfrac{2}{3}$

$y = \dfrac{2}{3}x - \dfrac{2}{3} + 7$

$\boxed{y = \dfrac{2}{3}x + \dfrac{19}{3}}$

2. Given the function $f(x) = 3x + 2$, calculate

$$\frac{f(a+h) - f(a)}{h}$$

. Simplify your answer to lowest terms to receive full credit.

$f(a+h) = 3(a+h) + 2$

$f(a) = 3a + 2$

$\dfrac{f(a+h) - f(a)}{h} = \dfrac{3(a+h) + 2 - (3a+2)}{h} = \dfrac{3a + 3h + 2 - 3a - 2}{h}$

$= \dfrac{3h}{h} = 3$

Multiple Choice Questions
Show all your work on the page where the question appears.
Clearly mark your answer both on the cover page on this exam
and in the corresponding questions that follow.

3. Find an equation for a linear function $f(x) = mx + b$ which has y-intercept 9 and x-intercept 2.

    Possibilities:

    (a) $f(x) = \frac{9}{2}x + 2$

    (b) $f(x) = \frac{9}{2}x + 9$

    (c) $f(x) = -\frac{9}{2}x + 9$

    (d) $f(x) = \frac{2}{9}x - \frac{9}{2}$

    (e) $f(x) = -\frac{9}{2}x + 2$

4. Find k if the line through $(8, 9)$ and $(1, k)$ has slope $m = \frac{6}{7}$.

    Possibilities:

    (a) $k = 7$

    (b) $k = 5$

    (c) $k = 3$

    (d) $k = -4$

    (e) $k = -6$

5. A total of $7,000 was invested, part of it at 2.5% annual interest and the remainder at 3.7%. If the total yearly interest amount is $190.97, how much was invested at 3.7%?

   Possibilities:

   (a) $7,000 at 3.7%

   (b) $1,454 at 3.7%

   (c) $5,669 at 3.7%

   (d) $1,331 at 3.7%

   (e) $5,546 at 3.7%

6. Stan and Hilda can mow the lawn in 55 minutes if they work together. If Hilda works 6 times as fast as Stan, how long would it take Stan to mow the lawn alone?

   Possibilities:

   (a) 385 minutes

   (b) 55 minutes

   (c) 330 minutes

   (d) $\dfrac{55}{6}$ minutes

   (e) $\dfrac{55}{7}$ minutes

7. Let $f(x) = 9x^2 + 7x + 2$. If the graph of $y = f(x)$ is reflected vertically over the x-axis, the result is the graph of $y = g(x)$. Which of the following gives the formula for $g(x)$?

   Possibilities:

   (a) $g(x) = -\frac{7}{18} + \frac{1}{18}\sqrt{-23 + 36x}$

   (b) $g(x) = 9(x-1)^2 + 7x - 5$

   (c) $g(x) = -9x^2 + 7x - 2$

   (d) $g(x) = 9x^2 - 7x + 2$

   (e) $g(x) = -9x^2 - 7x - 2$

8. Let $f(x) = mx + b$ be a linear function. If the graph of $y = f(x)$ is shifted left by 3, the result is the graph of $y = g(x)$. Find the slope and y-intercept of g.

   Possibilities:

   (a) Slope: $-3m - b$ y-intercept: $b + 3m$

   (b) Slope: m y-intercept: $b + 3m$

   (c) Slope: $-3m$ y-intercept: b

   (d) Slope: $-3m + b$ y-intercept: m

   (e) Slope: $\frac{1}{3}m$ y-intercept: b

9. Let $f(x) = x^2 + 3x + 4$. Let $g(x) = 2(x+7)^2 + 6(x+7) + 13$.

   What graph transformations take f to g?

   Possibilities:

   (a) Shift left 7, then vertically scale by 2, then shift up 5.

   (b) Shift right 7, then vertically scale by 2, then shift down 5.

   (c) Shift right 5, then vertically scale by 3, then shift up 4.

   (d) Shift left 7, then vertically scale by $\frac{1}{2}$, then shift down 5.

   (e) Shift right 7, then vertically scale by $\frac{1}{2}$, then shift up 5.

10. Given the function $f(x) = 4x^2 - 7$ find the average rate of change of f on the closed interval $[2, 9]$.

   Possibilities:

   (a) 44

   (b) 42

   (c) 1

   (d) 308

   (e) 27

11. Given the function $f(x) = 8x^2 + 3x - 6$ find the average rate of change of f on the closed interval $[x, x + h]$

   Possibilities:

   (a) 1

   (b) $6x - 11$

   (c) $16x + 8h + 1$

   (d) $-\frac{3}{16} + \frac{1}{16}\sqrt{201}$

   (e) $8h + 16x + 3$

12. Let $f(x) = x - 6$, and $g(x) = 3x^2 + 4x + 5$.

   Which of these is the formula for $(f \circ g)(x)$, that is, $f(g(x))$?

   Possibilities:

   (a) $f(g(x)) = 137$
   (b) $f(g(x)) = 3x^2 + 4x + 5 - 6$
   (c) $f(g(x)) = 3(x - 6)^2 + 4(x - 6) + 5$
   (d) $f(g(x)) = \dfrac{2 \pm \sqrt{7}}{3}$
   (e) $f(g(x)) = 3x^2 - 6 + 4x - 6 + 5$

13. Let $f(x)$ and $g(x)$ be defined by the following tables:

x	f(x)
1	7
2	6
3	8

x	g(x)
1	5
2	3
3	1

What number is $f(g(3))$?

Possibilities:

(a) $f(g(3)) = 7$

(b) $f(g(3)) = 3$

(c) $f(g(3)) = 5$

(d) $f(g(3)) = 8$

(e) $f(g(3)) = 6$

14. Refer to the tables in the previous problem. What number is $f^{-1}(8)$?

Possibilities:

(a) $f^{-1}(8) = -3$

(b) $f^{-1}(8)$ cannot be determined from the table

(c) $f^{-1}(8) = \frac{1}{8}$

(d) $f^{-1}(8) = -8$

(e) $f^{-1}(8) = 3$

15. Refer to the same tables as the previous problem. Additionally, let $h(x) = 10x + 100$.
What number is $(h \circ g)(2)$?

Possibilities:

(a) $h(g(2)) = 110$

(b) $h(g(2)) = 102$

(c) $h(g(2)) = 105$

(d) $h(g(2)) = 10$

(e) $h(g(2)) = 130$

16. Let $g(x) = 9x + 2$. What is $g^{-1}(47)$?

Possibilities:

(a) $g^{-1}(47) = 425$

(b) $g^{-1}(47) = x$

(c) $g^{-1}(47) = 47$

(d) $g^{-1}(47) = 5$

(e) $g^{-1}(47) = 3$

17. Suppose the point $(-13, 2)$ is on the graph of $y = f(x)$. Which point must be on the graph of $y = f^{-1}(x)$?

Possibilities:

(a) $(-13, -2)$ must be on the graph of $y = f^{-1}(x)$

(b) $(-2, \frac{1}{13})$ must be on the graph of $y = f^{-1}(x)$

(c) $(-\frac{1}{13}, \frac{1}{2})$ must be on the graph of $y = f^{-1}(x)$

(d) $(2, -13)$ must be on the graph of $y = f^{-1}(x)$

(e) $(13, 2)$ must be on the graph of $y = f^{-1}(x)$

18. Solve $x^2 + 6x = 27$.

Possibilities:

(a) $x = -3$ and $x = 9$

(b) $x = 27$ and $x = 21$

(c) $x = -9$ and $x = 3$

(d) $x = 0$ and $x = 27$

(e) $x = 0$ and $x = -6$

19. What is the x-coordinate of the vertex of $f(x) = x^2 - 6x - 72$?

Possibilities:

(a) $x = -72$ only

(b) $x = -6$ only

(c) $x = 36$ only

(d) $x = 3$ only

(e) $x = -6$ and $x = 12$

20. Which quadratic function has vertex $(6, -7)$ and y-intercept 5?

Possibilities:

(a) $f(x) = (x - 6)^2 + 7$

(b) $f(x) = \frac{1}{3}(x - 6)^2 - 7$

(c) $f(x) = 2(x + 7)^2 + 6$

(d) $f(x) = 6x^2 - 7x + 5$

(e) $f(x) = 5x^2 + 6x - 7$

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Right	**Grade**	Wrong
18	**90**	0
17	**85**	1
16	**80**	2
15	**75**	3
14	**70**	4
13	**65**	5
12	**60**	6
11	**55**	7
10	**50**	8
9	**45**	9
8	**40**	10
7	**35**	11
6	**30**	12
5	**25**	13
4	**20**	14
3	**15**	15
2	**10**	16
1	**5**	17
0	**0**	18

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