REG-FG-2324-ASM-SET 3-MATH
Suggested solutions

Multiple Choice Questions

1. A	2. B	3. D	4. A	5. B
6. C	7. C	8. C	9. B	10. D
11. A	12. A	13. A	14. C	15. D

1. A

$$g\left(\frac{1}{2}\right) + g(5) = \frac{\frac{1}{2}}{2 - \frac{1}{2}} + \frac{5}{2 - 5}$$
$$= -\frac{4}{3}$$

2. B

$$h\left(\frac{1}{x}\right) = \frac{1}{1 + \frac{1}{x}}$$
$$= 1 \div \frac{x + 1}{x}$$
$$= \frac{x}{1 + x}$$

3. D

$$f(x - 1) = 2(x - 1)^2 + 1$$
$$= 2x^2 - 4x + 3$$

4. A

I. ✓. $f(-x) = (-x)^2 - 2 = x^2 - 2 = f(x)$

II. ✗. $f(x + 2) = (x + 2)^2 - 2 = x^2 + 4x + 2$
$f(x) + f(2) = (x^2 - 2) + (2^2 - 2) = x^2$

III. ✗. $f(2x) = (2x)^2 - 2 = 4x^2 - 2$
$2f(x) = 2(x^2 - 2) = 2x^2 - 4$

5. B

$$a(-4)^2 - 2a(-4) + 5 = 77$$
$$24a = 72$$
$$a = 3$$

6. C

$$4 - k(-3) = 10$$
$$k = 2$$

7. C

$$f(3) - f(-3) = 18$$
$$2[(3) - (-3)^2] + k[(3) - (-3)] - [7 - 7] = 18$$
$$6k = 18$$
$$k = 3$$

8. C

$$-(-2)^2 - k(-2) + 3k = 26$$
$$5k - 4 = 26$$
$$k = 6$$

9. B

$$f(x) = g(x)$$
$$5 + 2x = x^2 - x - 5$$
$$0 = x^2 - 3x - 10$$
$$x = 5 \quad \text{or} \quad -2$$

10. D

$$y\text{-intercept} = -3(5 - 0)(0 - 3) + 10$$
$$= 55$$

11. A

Using the x-intercepts, the equation of the graph is in the form $y = a(x + 3)(2x - 1)$, where a is a constant.

$$y = a(x + 3)(2x - 1)$$
$$= a(2x^2 + 5x - 3)$$

The answer is A when $a = 1$.

12. A

The axis of symmetry is $x = -3$.

13. A

Axis of symmetry is $x = -5$.

14. C

$$\frac{(-4) + (-1)}{2} = -\frac{5}{2}$$

The axis of symmetry is $x = -\frac{5}{2}$.

15. D

$$y\text{-intercept} = (0 + 2)^2 - 1$$
$$= 3 \neq -1$$

The answer is D.

Conventional Questions

16. (a) $3x^2 - 12x + 14 = 3[x^2 - 2(2)(x) + 2^2] + 2$ 1M+1A

$= 3(x - 2)^2 + 2$

Thus, $a = -2$ and $b = 2$. 1A

(b) $\dfrac{6}{3x^2 - 12x + 14} = \dfrac{6}{3(x - 2)^2 + 2}$

The function has a maximum value $\dfrac{6}{2} = 3$ when $x = 2$. 1M

The claim is disagreed. 1A

17. (a) $-x^2 - 6x + 5$

$= -[x^2 + 2(x)(3) + 3^2] + 14$ 1M

$= -(x + 3)^2 + 14$ 1A

(b) Axis of symmetry: $x = -3$, 1A

Coordinates of vertex: $(-3,\ 14)$ 1A

18. (a) Substitute $(0,\ -6)$, we have $c = -6$. 1A

Substitute $(3,\ 0)$ and $(2,\ -6)$,

$$\begin{cases} 9a + 3b - 6 = 0 \\ 4a + 2b - 6 = -6 \end{cases}$$ 1M

Solving, we have $a = 2$ and $b = -4$. 2A

(b) $y = 2x^2 - 4x - 6$

$= 2\left[x^2 - 2(1)(x) + 1^2\right] - 8$ 1M

$= 2(x - 1)^2 - 8$ 1M

The minimum value of y is -8. 1A

(c) The axis of symmetry of the graph is $x = 1$. 1A

19. (a) $y = x^2 - 6x + (5p + 11)$

$= (x^2 - 6x + 3^2) + 5p + 2$ 1M

$= (x - 3)^2 + 5p + 2$

$5p + 2 = 6p$ 1M

$p = 2$ 1A

(b) When $p = 2$, $y = (x - 3)^2 + 12$.

The coordinates of its minimum point are $(3,\ 12)$. 1A

20. (a) $y = x^2 + ax + 40$

$= \left[x^2 + ax + \left(\frac{a}{2}\right)^2\right] - \frac{a^2}{4} + 40$ 1M

$= \left(x + \frac{a}{2}\right)^2 - \frac{a^2}{4} + 40$

$-\frac{a}{2} = 10$ 1M

$a = -20$ 1A

(b) When $x = 10$, $y = 10^2 - 20(10) + 40 = -60$.

The coordinates of vertex are $(10, -60)$. 1A

21. (a) $f(x) = 2x^2 - 16x + 7$

$= 2[x^2 - 2(x)(4) + 4^2] - 25$ 1M

$= 2(x - 4)^2 - 25$ 1M

The coordinates of the vertex are $(4, -25)$. 1A

(b) The minimum value of the function is -25. 1A

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