

REG-FG-2324-ASM-SET 1-MATH**Suggested solutions****Multiple Choice Questions**

1. C	2. A	3. B	4. A	5. C
6. D	7. B	8. D	9. B	10. B
11. A	12. B	13. B	14. A	15. C
16. A	17. E	18. B	19. E	20. B
21. C	22. A	23. C	24. B	25. C
26. C	27. A	28. B	29. D	30. C

1. C

$$\begin{aligned} -f\left(\frac{1}{3}\right) &= -\frac{\frac{1}{3}}{\frac{1}{3}+2} \\ &= -\frac{1}{7} \end{aligned}$$

2. A

$$\begin{aligned} 2f(-3) + 5 &= 2[(-3)^2 + 2(-3) - 14] + 5 \\ &= -17 \end{aligned}$$

3. B

$$\begin{aligned} 2f(3) - 5 &= 2[2(3)^2 - 7(3) + 5] - 5 \\ &= -1 \end{aligned}$$

4. A

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

5. C

$$\begin{aligned} f(4y) &= 10^{2(4y)} \\ &= 10^{8y} \end{aligned}$$

6. D

$$\begin{aligned} f(x) - f\left(\frac{1}{x}\right) &= \left(x - \frac{1}{x}\right) - \left(\frac{1}{x} - x\right) \\ &= 2\left(x - \frac{1}{x}\right) \end{aligned}$$

7. B

$$\begin{aligned}f(a) + f(-a) &= [a^2 - 3a - 1] + [(-a)^2 - 3(-a) - 1] \\&= 2a^2 - 2\end{aligned}$$

8. D

$$\begin{aligned}f(2m - 1) &= 3(2m - 1)^2 - 2(2m - 1) + 1 \\&= 12m^2 + (-12 - 4)m + (3 + 2 + 1) \\&= 12m^2 - 16m + 6\end{aligned}$$

9. B

$$\begin{aligned}f(1 + \beta) - f(1 - \beta) &= 3[(1 + \beta)^2 - (1 - \beta)^2] - [(1 + \beta) - (1 - \beta)] - [2 - 2] \\&= 3(4\beta) - (2\beta) \\&= 10\beta\end{aligned}$$

10. B

$$\begin{aligned}f(1 - k) &= (1 - k)^2 - (1 - k) + 1 \\&= k^2 - k + 1 \\&= f(k)\end{aligned}$$

11. A

$$\begin{aligned}f(2) - f(-2) &= 2[(2)^2 - (-2)^2] - 5[(2) - (-2)] + [k - k] \\&= -20\end{aligned}$$

12. B

- I. $\checkmark$. $f(-4) = (-4)^2 + 4(-4) = 0$
II. $\times$. $2f(-2) = 2[(-2)^2 + 4(-2)] = -8$ and $f(-4) = 0$
III. $\checkmark$. $f(x - 2) = (x - 2)^2 + 4(x - 2) = x^2 - 4$

13. B

$$\begin{aligned}h\left(\frac{1}{x}\right) &= \frac{1}{1 + \frac{1}{x}} \\&= 1 \div \frac{x + 1}{x} \\&= \frac{x}{1 + x}\end{aligned}$$

14. A

$$\begin{aligned}f(3) - f(-2) &= [(3)^2 - (-2)^2] - 4[(3) - (-2)] + [k - k] \\&= -15\end{aligned}$$

15. C

$$\begin{aligned} g(a+1) - g(a-1) &= [(a+1)^2 - (a-1)^2] - 3[(a+1) - (a-1)] \\ &= (4a) - 3(2) \\ &= 4a - 6 \end{aligned}$$

16. A

$$\begin{aligned} \text{I. } \checkmark. f(-x) &= (-x)^2 - 2 = x^2 - 2 = f(x) \\ \text{II. } \times. f(x+2) &= (x+2)^2 - 2 = x^2 + 4x + 2 \\ f(x) + f(2) &= (x^2 - 2) + (2^2 - 2) = x^2 \\ \text{III. } \times. f(2x) &= (2x)^2 - 2 = 4x^2 - 2 \\ 2f(x) &= 2(x^2 - 2) = 2x^2 - 4 \end{aligned}$$

17. E

$$\begin{aligned} 3x^2 + bx + 1 &= 3(-x)^2 + b(-x) + 1 \\ 2bx &= 0 \\ b &= 0 \\ f(-3) &= 3(-3)^2 + 1 = 28 \end{aligned}$$

18. B

$$\begin{aligned} f(k) &= k^2 - k - 3 = k \\ k^2 - 2k - 3 &= 0 \\ k &= 3 \quad \text{or} \quad -1 \end{aligned}$$

19. E

$$\begin{aligned} 3(-1)^2 + a(-1) - 7 &= 0 \\ a &= -4 \\ f(-2) &= 3(-2)^2 - 4(-2) - 7 = 13 \end{aligned}$$

20. B

$$\begin{aligned} a(-4)^2 - 2a(-4) + 5 &= 77 \\ 24a &= 72 \\ a &= 3 \end{aligned}$$

21. C

$$\begin{aligned} f(4) - f(3) &= 21 \\ [4^2 - 3^2] + k[4 - 3] + [7 - 7] &= 21 \\ 7 + k &= 21 \\ k &= 14 \end{aligned}$$

22. A

$$\begin{cases} f(0) = 1 = h(-3) + k \\ f(8) = 1 = (8 + h)(5) + k \end{cases}$$

Solving, we have $h = -5$ and $k = -14$.

23. C

$$\begin{aligned} 6\left(-\frac{2}{3}\right)^2 + k\left(-\frac{2}{3}\right) - 1 &= 6\left(\frac{3}{2}\right)^2 + k\left(\frac{3}{2}\right) - 1 \\ \frac{5}{3} - \frac{2k}{3} &= \frac{25}{2} + \frac{3k}{2} \\ k &= -5 \end{aligned}$$

24. B

$$k^2 + 5k - 4 = 2k$$

$$k^2 + 3k - 4 = 0$$

$$k = -4 \quad \text{or} \quad 1$$

25. C

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

$$k = 2$$

26. C

$$-(-2)^2 - k(-2) + 3k = 26$$

$$5k - 4 = 26$$

$$k = 6$$

27. A

$$g(-3) = g(3)$$

$$(-3)^2 + b(-3) + c = (3)^2 + b(3) + c$$

$$-6b = 0$$

$$b = 0$$

28. B

$$(-3)^2 - 7(-3) + 2k = 12$$

$$30 + 2k = 12$$

$$k = -9$$

29. D

$$g(-1) = g(7)$$

$$(-1)^2 - 2k(-1) + 1 = (7)^2 - 2k(7) + 1$$

$$2 + 2k = 50 - 14k$$

$$k = 3$$

30. C

$$f(3) - f(-3) = 18$$

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

$$6k = 18$$

$$k = 3$$

Conventional Questions

31. $f(1) = 2(1) + a = 2 + a$ 1A

$$f(f(1)) = f(2 + a)$$

$$= 2(2 + a) + a = 4 + 3a$$
 1A

$$f(1) = f(f(1))$$

$$2 + a = 4 + 3a$$

$$a = -1$$
 1A

32. (a) $f(3a) = 7 - 3(3a) - 3(3a)^2$
 $= 7 - 9a - 27a^2$ 1A

$$f(a + 1) = 7 - 3(a + 1) - 3(a + 1)^2$$

 $= -3a^2 - 9a + 1$ 1A

(b) $f(3a) = f(a + 1)$
 $7 - 9a - 27a^2 = -3a^2 - 9a + 1$
 $0 = 24a^2 - 6$ 1M

$$a = \pm \frac{1}{2}$$
 1A

33. (a) Sum $= S(150) = \frac{150(150 + 1)}{2} = 11\,325$ 1A

(b) $\frac{n(n + 1)}{2} = 2628$ 1M

$$n^2 + n - 5256 = 0$$

 $n = 72 \quad \text{or} \quad -73 \text{ (rejected)}$ 1A

(c) Sum of first $2k$ positive integers $= \frac{2k(2k + 1)}{2}$
 $1296 + (1296 + k) = \frac{2k(2k + 1)}{2}$ 1M

$$2592 + k = 2k^2 + k$$

$$k^2 = 1296$$

$$k = 36 \quad \text{or} \quad -36 \text{ (rejected)}$$
 1A

Required sum is $1296 + 36 = 1332$. 1A