

## *Model Answers:* **Using Functions**

Using Functions  
study guide



You will use the following information to answer the first two questions on this topic.

The function  $f(x) = 3x - 1$  says take the input  $x$  multiply it by 3 and then subtract 1.

The function  $g(x) = 3 - 2x^2$  says take the input  $x$ , square it, multiply this by minus 2 and then add 3.

The function  $h(x) = \frac{1}{2}x$  says halve the input  $x$ .

1.

(a)  $f(2) = 3 \times 2 - 1 = 5$

(b)  $f(-2) = 3 \times (-2) - 1 = -7$

(c)  $g(3) = 3 - 2 \times 3^2 = 3 - 18 = -15$

(d)  $g\left(\frac{1}{2}\right) = 3 - 2 \times \left(\frac{1}{2}\right)^2 = 3 - \frac{1}{2} = \frac{5}{2}$

(e)  $h(-5) = -\frac{5}{2}$

(f)  $h\left(-\frac{1}{4}\right) = \frac{1}{2} \times \left(-\frac{1}{4}\right) = -\frac{1}{8}$

(g)  $f(0.2) = 3 \times 0.2 - 1 = -0.4$

(h)  $g(-3.4) = 3 - 2 \times (-3.4)^2 = 3 - 23.12 = -20.12$

2.

(a)  $f(t) = 3t - 1$

(b)  $f(r) = 3r - 1$

(c)  $f(\theta + 1) = 3(\theta + 1) - 1 = 3\theta + 3 - 1 = 3\theta + 2$

(d)  $f(r^2) = 3r^2 - 1$

(e)  $g(t) = 3 - 2t^2$

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

(g)  $g(-3x) = 3 - 2(-3x)^2 = 3 - 2(9x^2) = 3 - 18x^2$

(h)  $g(1/r) = 3 - 2(1/r)^2 = 3 - \frac{2}{r^2}$

(i)  $h(x + 2) = \frac{x + 2}{2}$

(j)  $h(\frac{1}{2}x) = \frac{\frac{1}{2}x}{2} = \frac{1}{2} \times \frac{x}{2} = \frac{x}{4}$

(k)  $h(2 - x) = \frac{2 - x}{2} = 1 - \frac{x}{2}$

(l)  $h(pq) = \frac{pq}{2}$

3. The multivariable function  $f(x, y) = x^2 - y^2$  says that you square the first input ( $x$ ) and then subtract the square of the second input ( $y$ ).

(a)  $f(1, 2) = 1^2 - 2^2 = 1 - 4 = -3$

(b)  $f(0, -2) = 0^2 - (-2)^2 = 0 - 4 = -4$

(c)  $f(-2, 0) = (-2)^2 - 0^2 = 4 - 0 = 4$

(d)  $f(-2, -2) = (-2)^2 - (-2)^2 = 4 - 4 = 0$

(e)  $f(0, x) = 0^2 - x^2 = -x^2$

(f)  $f(y, 0) = y^2 - 0^2 = y^2$

(g)  $f(p, q) = p^2 - q^2$

(h)  $f(2x, 2y) = (2x)^2 - (2y)^2 = 4x^2 - 4y^2$

(i)

$$\begin{aligned} f(x+1, y-2) &= (x+1)^2 - (y-2)^2 \\ &= (x^2 + 2x + 1) - (y^2 - 4y + 4) \\ &= x^2 + 2x + 1 - y^2 + 4y - 4 \\ &= x^2 - y^2 + 2x + 4y - 3 \end{aligned}$$

(j)

$$\begin{aligned} f(1-y, x+2) &= (1-y)^2 - (x+2)^2 \\ &= (1 - 2y + y^2) - (x^2 + 4x + 4) \\ &= 1 - 2y + y^2 - x^2 - 4x - 4 \\ &= y^2 - x^2 - 2y - 4x - 3 \end{aligned}$$

(k)  $f(1-x, 2y) = (1-x)^2 - (2y)^2 = 1 - 2x + x^2 - 4y^2$

(l)  $f(t^2, 1/r^2) = (t^2)^2 - \left(\frac{1}{r^2}\right)^2 = t^4 - \frac{1}{r^4}$



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