Assignment 6 Solutions

1. a) \( f(-1) = (-1)^2 + 2 \times -1 = 1 - 2 = -1 \)
   b) \( g(2) = -2^2 + 2 = -4 + 2 = -2 \)
   c) \( h(9) = \sqrt{9} = 3 \)

d) \( f(h(4)) = f(\sqrt{4}) = f(2) = 2^2 + 2 \times 2 = 4 + 4 = 8 \)
e) \( g(f(-1)) = g(-1) \) (from a))
   \( = -1^2 - 1 = -1 - 1 = -2 \)

2. a) Domain \((-\infty, \infty)\) Range \([0, \infty)\)
   b) Domain \((-\infty, -3) \cup (-3, \infty)\) Range \((-\infty, 0) \cup (0, \infty)\) (The range is difficult here. No marks deducted.)
   c) Domain \([3, \infty)\) Range \([0, \infty)\)

3. a) \( a = 1 \), \( b = 5 \), \( c = 6 \)
   \[ x = \frac{-5 \pm \sqrt{5^2 - 4 \times 1 \times 6}}{2 \times 1} = \frac{-5 \pm \sqrt{25 - 24}}{2} = \frac{-5 \pm 1}{2} \]
   \[ = -2 \text{ or } -3 \]
   b) \( a = 2 \), \( b = -7 \), \( c = -4 \)
   \[ x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 2 \times -4}}{2 \times 2} = \frac{7 \pm \sqrt{49 + 32}}{4} = \frac{7 \pm \sqrt{81}}{4} \]
   \[ = \frac{7 + 9}{4} \text{ or } \frac{7 - 9}{4} \]
   \[ = 4 \text{ or } -\frac{1}{2} \]
   c) \( a = 2 \), \( b = 1 \), \( c = 3 \)
   \[ x = \frac{-1 \pm \sqrt{1^2 - 4 \times 2 \times 3}}{2 \times 1} = \frac{-1 \pm \sqrt{1 - 24}}{2} = \frac{-1 \pm \sqrt{-23}}{2} \]
   We can't find the square root of a negative number, so there are no solutions (i.e. the graph doesn't cut the x-axis).

4. a) \( x - 3 = 0 \) or \( x + 2 = 0 \)
   \[ x = 3 \text{ or } x = -2 \]
   b) \( 2x - 4 = 0 \) or \( 3x + 9 = 0 \)
   \[ 2x = 4 \text{ or } 3x = -9 \]
   \[ x = 2 \text{ or } x = -3 \]
   c) \( -3x - 3 = 0 \)
   \[ -3x = 3 \]
   \[ x = -1 \]

5. (i) \( 2y - 3x = 1 \), so \( 2y = 3x + 1 \). Hence this is a straight line, with positive gradient and positive y-intercept.
   Hence the matching graph is Graph G. \( \text{(}y = \frac{3x}{2} + \frac{1}{2}\text{)} \)
(ii) \(-y - x = 2\), so \(-y = x + 2\), so \(y = -x - 2\). Hence this is a straight line, with negative gradient and negative y-intercept. Hence the matching graph is Graph J. \( \text{J} \)
(iii) \(-3y + x = 1\), so \(-3y = -x + 1\), so \(3y = x - 2\). Hence this is a straight line, with positive gradient and negative y-intercept. Hence the matching graph is Graph E. \( \text{(}y = \frac{x}{3} - \frac{2}{3}\text{)} \)
(iv) \(y = 2x^2\). This equation includes an \(x^2\) term with a positive coefficient, so the graph is a parabola which turns upwards. Also, the y-intercept is 0. Hence the matching graph is Graph P. \( \text{P} \)
(v) \(y = 2 - 3x\), so \(y = 2 \mid 3x \mid\), which is a graph of absolute value. Hence the matching graph is Graph N. \( \text{N} \)
(vi) \(y = -1 - 4x\), so \(y = -1 \mid 4x \mid\), which is a graph of negative absolute value. Hence the matching graph is Graph M. \( \text{M} \)
(vii) \(-3y + 2 = -3\), so \(-3y = -5\), so \(3y = 5\). Hence this is a horizontal line, with y positive. Hence the matching graph is Graph C. \( \text{(}y = \frac{5}{3}\text{)} \)
(viii) \(-3x = 3\), so \(3x = -3\). Hence this is a vertical line, with x negative. Hence the matching graph is Graph A. \( \text{(}x = -1\text{)} \)
\( \text{A} \)
6. Adams Pig Bank \[1000(1 + 0.06)^1 = 1000 \times 1.06\]  
\[= 1060\]

Bank of Jennings \[1000(1 + 0.0589/4)^4 = 1000 \times 1.014725^4\]  
\[= 1060.21\]

Therefore the Bank of Jennings is the better investment by 21 cents!