

Quiz #3B – The Last Quadratic Quiz

[12 marks]

1. Convert the equation $y=2(x-1)^2-3$ to standard form. [4 marks]

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

2. Convert the equation $y=2x^2-4x-1$ to vertex form by completing the square.. [4 marks]

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

3. Determine the roots of $y = 2x^2 - 4x - 1$. [4 marks]

$$y = 2x^2 - 4x - 1$$

Option 1: Solve from vertex form (from previous page)

$$0 = 2(x-1)^2 - 3$$

$$3 = 2(x-1)^2$$

$$\frac{3}{2} = (x-1)^2$$

$$\pm\sqrt{\frac{3}{2}} = x-1$$

$$\pm 1.22 = x-1$$

$$x-1 = 1.22 \quad \text{or} \quad x-1 = -1.22$$

$$x = 2.22 \quad \text{or} \quad x = -0.22$$

Option 2: Use the quadratic formula

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(-1)}}{2(2)}$$

$$x = \frac{4 \pm \sqrt{16+8}}{4}$$

$$x = \frac{4 \pm \sqrt{24}}{4}$$

$$x = \frac{4 \pm 4.9}{4}$$

$$x = \frac{4+4.9}{4} \quad \text{or} \quad x = \frac{4-4.9}{4}$$

$$x = 2.25 \quad \text{or} \quad x = 0.25$$

4. The path of an eagle swooping down across a lake is given by $h = 5t^2 - 100t + 499$, where h is the time in seconds and h is the height above the water's surface. A fish is swimming 2.5m below the surface of the lake. Is it safe from the eagle? [3 marks]

There are many ways to solve this! In this solution, we'll sub in the depth of the fish, and see if the relation has any solutions:

$$-2.5 = 5t^2 - 100t + 499$$

$$0 = 5t^2 - 100t + 501.5$$

Check the discriminant:

$$b^2 - 4ac$$

$$= (-100)^2 - 4(5)(501.5)$$

$$= 10000 - 10030$$

$$= -30$$

There is no solution, so the eagle does not reach the fish. It's safe!