Review of Quadratic Equations Solutions

Practice Questions

1a) $\dfrac{\sqrt{48}}{\sqrt{2}}$

$= \sqrt{24}$

$= \sqrt{4}\sqrt{6}$

$= 2\sqrt{6}$

b) $\dfrac{\sqrt{6} \times \sqrt{12}}{\sqrt{3}}$

$= \dfrac{\sqrt{72}}{\sqrt{3}}$

$= \sqrt{24}$

$= \sqrt{4}\sqrt{6}$

$= 2\sqrt{6}$

2a) $x^2 - 18 = -3x$

$x^2 + 3x - 18 = 0$

$(x+6)(x-3) = 0$

$x = -6$ or $x = 3$

b) $3x^2 - 5x + 1 = 0$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \dfrac{5 \pm \sqrt{(-5)^2 - 4(3)(1)}}{2(3)}$

$= \dfrac{5 \pm \sqrt{25 - 12}}{6}$

$= \dfrac{5 \pm \sqrt{13}}{6}$

$= 1.43$ or 0.23

3a) $x^2 - 6x + 9 = 0$

$b^2 - 4ac$

$= (-6)^2 - 4(1)(9)$

$= 36 - 36$

$= 0$

$b^2 - 4ac = 0$

$\therefore$ One real solution

b) $2x^2 - 7x + 8 = 0$

$b^2 - 4ac$

$= (-7)^2 - 4(2)(8)$

$= 49 - 64$

$= -15$

$b^2 - 4ac < 0$

$\therefore$ No real solutions.

standard form

#4. $y = -2x^2 + 4x + 6$ ⟶ $y = -2x^2 + 4x + 6$

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

$y = -2(x-3)(x+1)$ ⟵ factored form

$\left(\frac{b}{2}\right)^2 = \left(\frac{-2}{2}\right)^2 = 1$

$\left(\frac{b}{2}\right) = \left(\frac{-2}{2}\right) = -1$

$y = -2(x^2 - 2x) + 6$

$y = -2(x^2 - 2x + 1 - 1) + 6$

$y = -2(x^2 - 2x + 1) + 2 + 6$

$y = -2(x^2 - 2x + 1) + 8$

$y = -2(x-1)^2 + 8$

vertex form

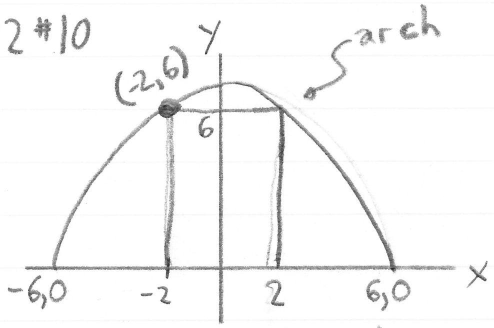
x-ints: 3 & −1 (from factored form)

y-int: 6 (from standard form)

direction of opening: down (negative "a" value)

vertex: (1, 8) (from vertex form)

pg 192 #10



Equation for Arch

$h = a(x-r)(x-s)$

$h = a(x+6)(x-6)$

At 4m from the left edge ($x=-2$) the height is 6m ($h=6$) so...

$6 = a(-2+6)(-2-6)$

$6 = a(4)(-8)$

$\frac{6}{-32} = \frac{-32a}{-32}$

$a = -\frac{3}{16}$ so...

$h = \frac{-3}{16}(x+6)(x-6)$

The truck is 5m tall ($h=5$) 1.75m from its centre (when $x = 1.75$). Let's find the height of the tunnel 1.75m from the centre.

set $x = 1.75$

$h = \frac{-3}{16}(1.75+6)(1.75-6)$

$= \frac{-3}{16}(7.75)(-4.25)$

$\cong 6.2\text{m}$

The height of the tunnel is higher than the truck at its edge.

∴ The truck will fit through the arch.

pg 199 # 8.

① $y = 3x + k$

② $y = 2x^2 - 5x + 3$

sub ② into ①

$2x^2 - 5x + 3 = 3x + k$

$2x^2 - 5x + 3 - 3x - k = 0$

$2x^2 - 8x + (3-k) = 0$

For one solⁿ, the discriminant must be equal to zero

$a = 2$

$b = -8$

$c = (3-k)$

$b^2 - 4ac = 0$

$(-8)^2 - 4(2)(3-k) = 0$

$64 - 8(3-k) = 0$

$64 - 24 + 8k = 0$

$40 + 8k = 0$

$\frac{8k}{8} = \frac{-40}{8}$

$k = -5$

Application of Quadratic Functions

1. **A flare is fired straight up from a sinking boat. The height of the flare given by the equation:**

$$h = -5t^2 + 80t$$

where

- **h is the height in metres.**
- **t is the time in seconds after it is launched.**

a) What was the initial height of the flare?

set $t=0$

$h = -5(0)^2 + 80(0)$

$h = 0m$

b) What maximum height will the flare reach?

Change to vertex form by completing the square

$h = -5t^2 + 80t + 0$

$h = -5(t^2 - 16t) + 0$

$\left(\frac{b}{2}\right)^2 = \left(\frac{-16}{2}\right)^2 = 64 \rightarrow h = -5(t^2 - 16t + 64 - 64) + 0$

$h = -5(t^2 - 16t + 64) + 320 + 0$

$\left(\frac{b}{2}\right) = \left(\frac{-16}{2}\right) = -8 \rightarrow h = -5(t-8)^2 + 320$

The vertex is $(8, 320)$

Therefore, the flare reaches a maximum height of 320m after 8 seconds.

c) How long does it take the flare to reach the maximum height?

8 seconds

d) When will the flare hit the ground?

set $h=0$

$0 = -5t^2 + 80t$

$0 = -5t(t-16)$

$t=0$ or $t=16$

The flare is launched at $t=0s$ and hits the ground after 16 seconds.