

SOLUTIONS \Rightarrow QUADRATICS EXAM REVIEW

1.

a) 4, 26, 84, 196, 380

D_1 22, 58, 112, 184

D_2 36, 54, 72

D_3 18, 18

CUBIC

b) (1, 5), (2, 15), (3, 45), (4, 135), (5, 405)

y-values: 5, 15, 45, 135, 405

$\times 3$ $\times 3$ $\times 3$ $\times 3$ EXPONENTIAL

c) -10, -2, 13, 35, 64, 100

$\begin{array}{cccccc} & \vee & \vee & \vee & \vee & \vee \\ D_1 & 8 & 15 & 22 & 29 & 36 \end{array}$

D_2 7 7 7 7 QUADRATIC

d) (0, 1000) (1, 995.1) (2, 980.4) (3, 955.9) (4, 921.6) (5, 877.5)

y-values: 1000, 995.1, 980.4, 955.9, 921.6, 877.5

$\begin{array}{cccccc} & \vee & \vee & \vee & \vee & \vee \\ D_1 & -4.9 & -14.7 & -24.5 & -34.3 & -44.1 \end{array}$

D_2 -9.8 -9.8 -9.8 -9.8

QUADRATIC

e) -11, 21, 53, 85

$\downarrow \quad \downarrow \quad \downarrow$
D, 32 32 32 LINEAR

Q. Perimeter = 300m
Let $x =$ width
Then $300 - 2x =$ length



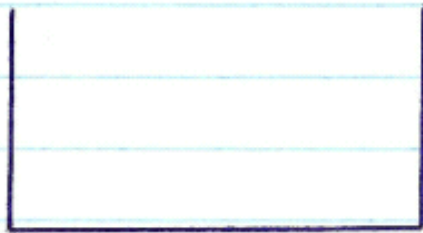
$$A = \text{length} \times \text{width}$$

$$A = (300 - 2x)(x)$$

OR

$$A = (300 - 2w)(w)$$

3.



$$P = 688 \text{ m}$$

Let $x = \text{width}$

$$\text{Then } \frac{688 - 2x}{2} = \text{length}$$

$$344 - x = \text{length}$$

$$A = \text{length} \times \text{width}$$

$$A = (344 - x)(x)$$

$$4.a) \quad y = (x+3)^2 - 7 \text{ (SF)}$$

$$y = (x+3)(x+3) - 7$$

$$y = x^2 + 3x + 3x + 9 - 7$$

$$y = x^2 + 6x + 2 \text{ (GF)}$$

$$b) \quad 5(y - 1/3) = (x-8)^2 \text{ (TF)}$$

$$5(y - 1/3) = (x-8)(x-8)$$

$$5(y - 1/3) = x^2 - 8x - 8x + 64$$

$$5(y - 1/3) = x^2 - 16x + 64$$

$$y - 1/3 = 1/5(x^2 - 16x + 64)$$

$$y - 1/3 = 1/5x^2 - 16/5x + 64/5$$

$$y = 1/5x^2 - 16/5x + 64/5 + 1/3$$

$$y = 1/5x^2 - 16/5x + 192/15 + 5/15$$

$$y = 1/5x^2 - 16/5x + 197/15 \text{ (GF)}$$

$$d) 2(y-5) = (x+7)^2 \quad (\text{TF})$$

$$2(y-5) = (x+7)(x+7)$$

$$2(y-5) = x^2 + 7x + 7x + 49$$

$$2(y-5) = x^2 + 14x + 49$$

$$y-5 = \frac{1}{2}(x^2 + 14x + 49)$$

$$y-5 = \frac{1}{2}x^2 + \frac{14}{2}x + \frac{49}{2}$$

$$y = \frac{1}{2}x^2 + 7x + \frac{49}{2} + \frac{5}{1}$$

$$y = \frac{1}{2}x^2 + 7x + \frac{49}{2} + \frac{10}{2}$$

$$y = \frac{1}{2}x^2 + 7x + \frac{59}{2} \quad (\text{GF})$$

$$d) y = 2(x+3)^2 + 7 \quad (\text{SF})$$

$$y = 2(x+3)(x+3) + 7$$

$$y = (2x+6)(x+3) + 7$$

$$y = 2x^2 + 6x + 6x + 18 + 7$$

$$y = 2x^2 + 12x + 25 \quad (\text{GF})$$

$$5. a) \frac{1}{2}y = (x+7)^2 \text{ (TF)} \quad b) 3(y-7) = (x-9)^2 \text{ (TF)}$$

$$y = 2(x+7)^2 \text{ (SF)}$$

$$y-7 = \frac{1}{3}(x-9)^2$$

$$y = \frac{1}{3}(x-9)^2 + 7 \text{ (SF)}$$

$$c) 7(y+8) = (x+2)^2 \text{ (TF)}$$

$$y+8 = \frac{1}{7}(x+2)^2$$

$$y = \frac{1}{7}(x+2)^2 - 8 \text{ (SF)}$$

$$6. h = -5t^2 + 20t$$

$$a) t = 3$$

$$h = -5(3)^2 + 20(3)$$

$$h = -5(9) + 60$$

$$h = -45 + 60$$

$$h = 15 \text{ m}$$

$$b) h = -5t^2 + 20t$$

$$\textcircled{2} h = -5(t^2 - 4t)$$

$$\textcircled{3} h - 20 = -5(t^2 - 4t + 4)$$

$$\textcircled{4} h - 20 = -5(t - 2)^2$$

$$\textcircled{5} h = -5(t - 2)^2 + 20$$

Vertex (2, 20)

The maximum height of the rocket is 20m

It takes 2 seconds to reach the maximum height.

c) When the rocket hits the ground $\rightarrow h=0$.

$$0 = -5t^2 + 20t$$

3 methods to solve this problem.

#1 Factoring

$$0 = -5t^2 + 20t$$

$$0 = -5t(t-4)$$

$$\frac{-5t}{-5} = 0 \quad \text{or} \quad \frac{t-4}{t} = 0$$
$$t = 0 \quad \quad \quad t = 4$$

It took the rocket 4 seconds to hit the ground.

#2 Quadratic Formula

$$0 = -5t^2 + 20t$$

$$a = -5, b = 20, c = 0$$

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

$$x = \frac{-20 \pm \sqrt{(20)^2 - 4(-5)(0)}}{2(-5)}$$

$$x = \frac{-20 \pm \sqrt{400 - 0}}{-10}$$

$$x = \frac{-20 \pm \sqrt{400}}{-10}$$

$$x = \frac{-20 \pm 20}{-10}$$

$$x = \frac{-20 + 20}{-10}$$

$$x = \frac{-20 - 20}{-10}$$

$$x = \frac{0}{-10}$$

$$x = \frac{-40}{-10}$$

$$x = 0$$

$$x = 4$$

#3 Completing the Square

$$0 = -5t^2 + 20t$$

$$\textcircled{2} \quad 0 = t^2 - 4t$$

$$\textcircled{3} \quad 4 = t^2 - 4t + 4$$

$$\textcircled{4} \quad 4 = (t-2)^2$$

$$\textcircled{5} \quad \pm\sqrt{4} = t-2$$

$$\textcircled{6} \quad \pm 2 = t-2$$

$$2 \pm 2 = t$$

$$2+2=t \quad \text{OR} \quad 2-2=t$$

$$4=t$$

$$0=t$$

$$7. h = -5t^2 + 5t + 3$$

a) The diving board is 3 m high.
* The constant term in the equation represents initial height.

$$b) h = -5t^2 + 5t + 3$$

$$\textcircled{1} h - 3 = -5t^2 + 5t$$

$$\textcircled{2} h - 3 = -5(t^2 - t)$$

$$\textcircled{3} h - 3 - \frac{5}{4} = -5(t^2 - t + \frac{1}{4})$$

$$\textcircled{4} h - \frac{12}{4} - \frac{5}{4} = -5(t - \frac{1}{2})^2$$

$$h - \frac{17}{4} = -5(t - \frac{1}{2})^2$$

$$\textcircled{5} h = -5(t - \frac{1}{2})^2 + \frac{17}{4}$$

Vertex $(\frac{1}{2}, \frac{17}{4})$

She reaches a maximum height of $\frac{17}{4}$ m (4.25 m) after $\frac{1}{2}$ (0.5) seconds.

$$d) 0 = -5t^2 + 5t + 3$$

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

$$x = \frac{-5 \pm \sqrt{(5)^2 - 4(-5)(3)}}{2(-5)}$$

$$x = \frac{-5 \pm \sqrt{25 + 60}}{-10}$$

$$x = \frac{-5 \pm \sqrt{85}}{-10}$$

$$x = \frac{-5 \pm 9.22}{-10}$$

$$x = \frac{-5 + 9.22}{-10}$$

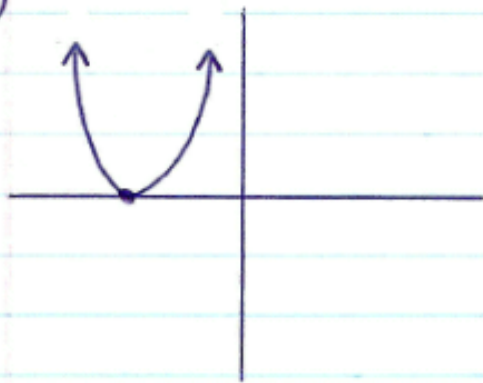
$$x = -\cancel{0.422} \text{ seconds}$$

$$x = \frac{-5 - 9.22}{-10}$$

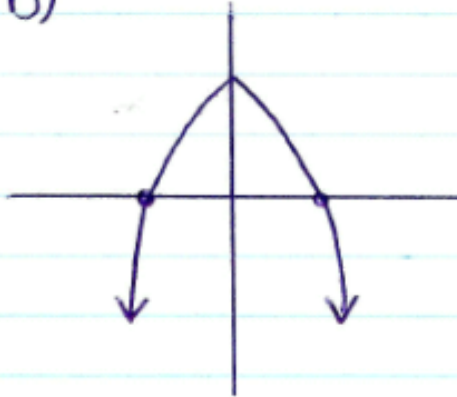
$$x = 1.422 \text{ seconds}$$

8.

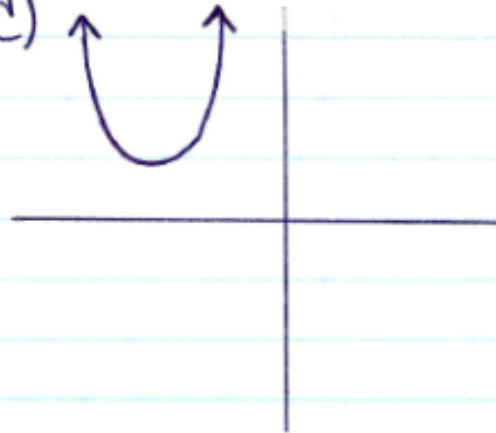
a)



b)



c)



9. One real root $\Rightarrow D=0$

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

$$a=1, b=-3, c=k$$

$$D = b^2 - 4ac$$

$$0 = (-3)^2 - 4(1)(k)$$

$$0 = 9 - 4k$$

$$\cancel{4}k = \frac{9}{\cancel{4}}$$

$$k = \frac{9}{4}$$

10. 2 real roots $\Rightarrow \mathbb{D} > 0$

$$y = x^2 - 8x + K$$

$a=1, b=-8, c=K$

$$\begin{aligned} \mathbb{D} &= b^2 - 4ac \\ b^2 - 4ac &> 0 \\ (-8)^2 - 4(1)(K) &> 0 \\ 64 - 4K &> 0 \\ -4K &> -64 \\ \frac{-4K}{-4} &> \frac{-64}{-4} \\ K &< 16 \end{aligned}$$

$$11. a) t_n = 3n^3 + 2n^2 - 4.$$

$$t_1 = 3(1)^3 + 2(1)^2 - 4$$

$$t_1 = 3(1) + 2(1) - 4$$

$$t_1 = 3 + 2 - 4$$

$$t_1 = 1$$

$$t_2 = 3(2)^3 + 2(2)^2 - 4$$

$$t_2 = 3(8) + 2(4) - 4$$

$$t_2 = 24 + 8 - 4$$

$$t_2 = 32 - 4$$

$$t_2 = 28$$

$$t_3 = 3(3)^3 + 2(3)^2 - 4$$

$$t_3 = 3(27) + 2(9) - 4$$

$$t_3 = 81 + 18 - 4$$

$$t_3 = 95$$

$$\{1, 28, 95\}$$

$$b) t_n = n^2 + 4n - 8$$

$$t_1 = (1)^2 + 4(1) - 8$$

$$t_1 = 1 + 4 - 8$$

$$t_1 = -3$$

$$t_2 = (2)^2 + 4(2) - 8$$

$$t_2 = 4 + 8 - 8$$

$$t_2 = 4$$

$$t_3 = (3)^2 + 4(3) - 8$$

$$t_3 = 9 + 12 - 8$$

$$t_3 = 13$$

$$\{-3, 4, 13\}$$

$$12. \frac{1}{a} (y-k) = (x-h)^2$$

a) Up/Down \Rightarrow "k"

b) left/Right \Rightarrow "h"

c) become wider or narrower \Rightarrow "a"