

# Quadratic functions Solutions

Q1.  $y = (x-1)^2 - 16$

(a) TP = (1, -16)

(b)  $x = 1$

(c) A and B are the roots  $\Rightarrow y = 0$

$$\begin{aligned} (x-1)^2 - 16 &= 0 \\ (x-1)(x-1) - 16 &= 0 \\ x^2 - x - x + 1 - 16 &= 0 \\ x^2 - 2x - 15 &= 0 \\ (x + 3)(x - 5) &= 0 \\ x + 3 = 0 & \quad x - 5 = 0 \\ x = -3 & \quad x = 5 \\ A(-3, 0) & \quad B(5, 0) \end{aligned}$$

Q2.  $7 + 6x - x^2 = 0$

$$\begin{aligned} (7 - x)(1 + x) &= 0 \\ 7 - x = 0 & \quad 1 + x = 0 \\ \underline{7 = x} & \quad \underline{x = -1} \end{aligned}$$

TP:  $x$ -coordinate lies half-way between -1 and 7  
so  $x = 3$

sub. 3 in for  $x$

$$\begin{aligned} y &= 7 + 6x - x^2 \\ y &= 7 + 6(3) - (3)^2 \\ y &= 7 + 18 - 9 \\ \underline{y = 16} \end{aligned}$$

TP = (3, 16)

Q3.  $y = (x+2)^2 - 16$

(a) P = (-2, -16)

(b)  $-2 \rightarrow 2 = 4$  units  
 $2 + 4 = 6$

Q = (6, -16)

(c)  $6 + 4 + 4 = 14$   
S = (14, -16)

$$\begin{aligned} y &= (x-a)^2 + b \\ y &= (x-14)^2 - 16 \end{aligned}$$

Q4.  $y = 36 - (x-2)^2$

(a) TP = (2, 36)

(b)  $x = 2$

Q5 (c)  $y = 20$   $y = 36 - (x-2)^2$

~~sub. 20 into eqn~~

~~20 = 36 - (x-2)^2~~

axis of symmetry  $x = 2$

$\Rightarrow$   $6 \rightarrow 2 = 4$  units  
 $2 - 4$  units = -2

S = (-2, 20)

Q5. (a)  $y = (x-3)^2 - 4$

TP = (3, -4)

(b)  $x = 3$

(c) A(1, 0) ↙ axis (half-way)

$1 \rightarrow 3 = 2$  units

$3 + 2 = 5$  B(5, 0)

Q6. (a)  $V = L \times B \times H$

$$\begin{aligned} V &= x(x+5)(1) = x^2 + 5x = 24 \\ x^2 + 5x - 24 &= 0 \end{aligned}$$

(b)  $x^2 + 5x - 24 = 0$

$(x - 3)(x + 8) = 0$

$x - 3 = 0$   $x + 8 = 0$

$x = 3$   $x = -8$

length can't be negative

breadth =  $x = 3$  m

Q7. (a)  $8x - x^2 = 0$

$x(8 - x) = 0$

$x = 0$  or  $8 - x = 0$

$x = 8$

(b) axis lies half-way between roots  
 $\Rightarrow x = 4$

(c) TP  $\Rightarrow$  sub 4 for  $x$  into  $y = 8x - x^2$   
 $y = 8(4) - 4^2 = 32 - 16 = 16$

TP = (4, 16)

Q8. (a)  $f(a, b) = \text{turning point}$

$$a = -5 \quad b = 1$$

(b)  $x = 5$

(c) P  $\Rightarrow$  y-intercept  $x = 0$

$$y = (0 - 5)^2 + 1$$

$$y = 25 + 1$$

$$y = 26 \quad P(0, 26)$$

Q has same y-coordinate

$\swarrow$  axis of symmetry

$$0 \rightarrow 5 = 5 \text{ units}$$

$$5 + 5 = 10$$

$$\Rightarrow Q = (10, 26)$$