Ex 2.6

Q1 (i) $a^2 + 28a + c$

$(14)^2 = 196$.

(ii) $x^2 - 6x + c$

$(-3)^2 = 9$.

(iii) $y^2 - 5y + c = 0$

$\left(\frac{-5}{2}\right)^2 = \frac{25}{4}$

Q2.

(i) $x^2 - 8x - 3 = 0$

$x^2 - 8x + 16 - 16 - 3 = 0$

$(x - 4)^2 - 19 = 0$

(ii) $x^2 - 2x - 5 = 0$

$x^2 - 2x + 1 - 1 - 5 = 0$

$(x - 1)^2 - 6 = 0$

(iii) $x^2 - 2x + 1 = 0$

$x^2 - 2x + 1 - 1 + 1 = 0$

$(x - 1)^2 = 0$

Q3 (i) $x^2 + 4x - 6 = 0$ $\quad (2)^2$

$x^2 + 4x + 4 - 4 - 6 = 0$

$(x+2)^2 - 10 = 0$

(ii) $x^2 + 9x + 4 = 0$ $\quad \left(\frac{9}{2}\right)^2$

$x^2 + 9x + \frac{81}{4} - \frac{81}{4} + 4 = 0$

$\left(x + \frac{9}{2}\right)^2 - \frac{65}{4} = 0$

(iii) $x^2 - 7x - 3 = 0$ $\quad \left(\frac{7}{2}\right)^2$

$x^2 - 7x + \frac{49}{4} - \frac{49}{4} - 3 = 0$

$\left(x - \frac{7}{2}\right)^2 - \frac{61}{4} = 0$

Q4 (i) $2x^2 + 4x - 5 = 0$

$2(x^2 + 2x - \frac{5}{2}) = 0$

$2(x^2 + 2x + 1 - 1 - \frac{5}{2}) = 0$

$2((x+1)^2 - \frac{7}{2}) = 0$

$2(x+1)^2 - 7 = 0$

$\Rightarrow$ Min pt is $(-1, -7)$

(ii) $3x^2 - 6x - 1 = 0$

$3(x^2 - 2x - \frac{1}{3}) = 0$

$3(x^2 - 2x + 1 - 1 - \frac{1}{3}) = 0$

$3((x-1)^2 - \frac{4}{3}) = 0$

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

$\Rightarrow$ Min pt is $(1, -4)$

Q4 (iii) $4x^2 + 2x + 3 = 0$

$4(x^2 + \frac{1}{4}x + \frac{3}{4}) = 0$

$4(x^2 + \frac{1}{4}x + \frac{1}{64} - \frac{1}{64} + \frac{3}{4}) = 0$

$4((x^2 + \frac{1}{8})^2 + \frac{47}{64}) = 0$

$4(x^2 + \frac{1}{8})^2 + \frac{47}{16} = 0$

$\Rightarrow$ Min Pt is $(-\frac{1}{8}, \frac{47}{4})$

Q5 $x^2 - 6x + k$

$x^2 - 6x + 9 - 9 + k = 0$

$(x-3)^2 - 9 + k = 0$

Values for which is Positive

$(x-3)^2$ is always positive

for $-9+k$ To be positive

$-9 + k > 0$

$k > 9$

Q6 $2x^2 - 12x + 7$

$2(x^2 - 6x + \frac{7}{2})$

$2(x^2 - 6x + 9 - 9 + \frac{7}{2})$

$2((x-3)^2 - \frac{11}{2})$

$2(x-3)^2 - 11$

Q7 $g(x) = x^2 + 8x + 20 = 0$ $g(x) \geq 4$.

$x^2 + 8x + 16 - 16 + 20 \geq 4$

$(x^2+4)^2 + 4 \geq 4$

$(x^2+4)^2$ is always Positive

$\Rightarrow$ anything Positive $+ 4 \geq 4$ True.

Q8

(i) Red $(-1, -5)$ Blue $(2, -1)$ Green $(4, 1)$

(ii) Red: $(x+1)^2 - 5$

$x^2 + 2x + 1 - 5$

$x^2 + 2x - 4$

Blue: $(x-2)^2 - 1$

$x^2 - 4x + 4 - 1$

$x^2 - 4x + 3$

Green: $(x-4)^2 + 1$

$x^2 - 8x + 16 + 1$

$x^2 - 8x + 17$.

Q9 $f(x) = x^2 + 4x + 7.$

(i) $x^2 + 4x + 4 - 4 + 7$

$(x+2)^2 + 3$

$\Rightarrow$ Min Value is 3

(ii) Value of x is -2

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

$\Rightarrow \frac{1}{3}$

Q10 $y = -x^2 + 6x$

$-1(x^2 - 6x)$

$-1(x^2 - 6x + 9 - 9)$

$-1((x-3)^2 - 9)$

$-(x-3)^2 + 9$

$\Rightarrow$ Max value is $(3, 9)$

Height is y. Find y at $x = 3$.

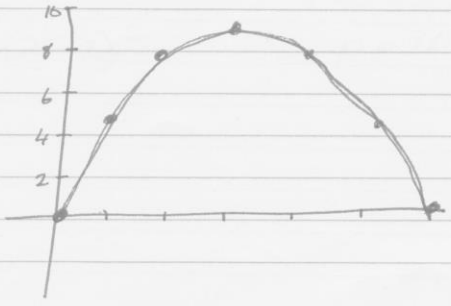
$y = -(3)^2 + 6(3)$

$y = -9 + 18$

$y = 9$ units.

$0 < x < 6$

x	y
0	0
1	5
2	8
3	9
4	8
5	5
6	0



Q11 (i) $y = x^2 - 6x + 8$

$x^2 - 6x + 9 - 9 + 8$

$(x-3)^2 - 1$ min pt $(3, -1)$

= graph C

(ii) $y = x^2 - 6x + 9$

$x^2 - 6x + 9 - 9 + 9$

$(x-3)^2 + 0$ Min pt $(3, 0)$

$\Rightarrow$ graph B.

(iii) $y = x^2 - 6x + 10$

$x^2 - 6x + 9 - 9 + 10$

$(x-3)^2 + 1$ Min pt $(3, 1)$

$\Rightarrow$ graph A.

Q12 C: Max pt is $(2, 4)$

$\Rightarrow 4 - a(x-2)^2 = y.$

Find a:

Take pt $(0, 3)$

$\Rightarrow 3 = 4 - a(0-2)^2$

$3 = 4 - 4a$

$+1 = +4a$

$\frac{1}{4} = a.$

$4 - \frac{1}{4}(x-2)^2$ $(\times 4)$

$16 - (x-2)^2$ $\Rightarrow p = 16,\ a = 1,\ q = 2$

Q12 D: Max (2, 4)

$\Rightarrow$ Eqn: $4 - a(x-2)^2$

Find a: Take pt (1,3)

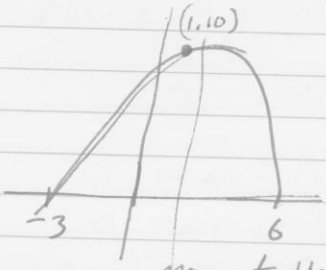
$3 = 4 - a(1-2)^2$

$3 = 4 - a(1)$

$a = 1$

$y = 4 - (x-2)^2$ $\quad p = 4 \quad a = 1 \quad q = 2$

Q13



Max at $1\frac{1}{2}$.

Max $\Rightarrow -x^2$

$\downarrow$

$q - a(x - 1\frac{1}{2})^2 = 0$

Roots are -3 & 6.

eqn: $-(x^2 - \text{Sum}\,x + \text{Product}) = 0$

$-(x^2 - 3x - 18) = 0$

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

Q14 min $(-1, 3)$ y intercept is 4.

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

$x^2 + 2x + 1 + 3 = 0$

$x^2 + 2x + 4 = 0$

y intercept ⇒ correct.

Q15 (i) Max pt $(6, 4)$

$f(x) = q - 0.1(x-p)^2$

$= 4 - 0.1(x-6)^2$

(ii) $0 = 4 - 0.1(x-6)^2$ $(\times 10)$

$0 = 40 - (x-6)^2$

$(x-6)^2 = 40$

$x - 6 = \pm\sqrt{40}$

$x = \pm\sqrt{40} + 6$

$x = 6 \pm 2\sqrt{10}$

(iii) $(6 + 2\sqrt{10}) - (6 - 2\sqrt{10})$

$6 + 2\sqrt{10} - 6 + 2\sqrt{10}$

$4\sqrt{10}$