# MORE ABOUT EQUATION

Form 5
Vol 3

**Part 4 – Add line**

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

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

$x^2+3x-4=x+1$

Hence $y=x+1$ should be added.

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

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

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

Hence $y=-5x+1$ should be added.

3. $3x^2+7x-1=0$

$x^2+\frac{7}{3}x-\frac{1}{3}=0$

$2x^2+\frac{14}{3}x-\frac{2}{3}=0$

$2x^2-5x-\frac{2}{3}=-\frac{29}{3}x$

$2x^2-5x+1=-\frac{29}{3}x+\frac{5}{3}$

Hence $y=-\frac{29}{3}x+\frac{5}{3}$ should be added

4. $2x^2+3x-8=0$

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

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

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

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

Hence $y=\frac{3}{2}x-3$ should be added

5. $2x^3+4x^2+x+7=0$

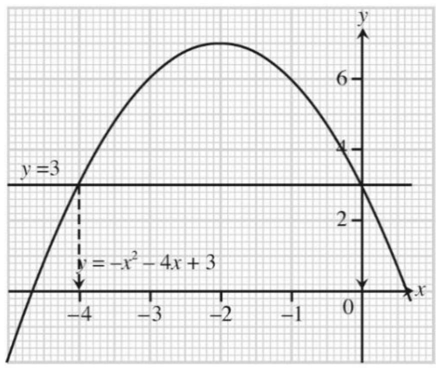
$$x^3+2x^2+\frac{1}{2}x+\frac{7}{2}=0$$

$$x^3+2x^2-6x+\frac{7}{2}=-\frac{13}{2}x$$

$$x^3+2x^2-6x+1=-\frac{13}{2}x-\frac{5}{2}$$

Hence $y=-\frac{13}{2}x-\frac{5}{2}$ should be added.

**Part 5 – Range**

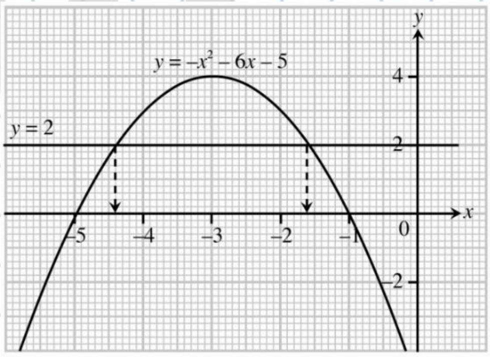



1. (a) When $x \le -4.0$ or $x \ge 0.0$, the corresponding part of the graph of $y=-x^2-4x+3$ lies on or below the line $y=3$.

$\therefore$ The solutions of $-x^2-4x+3 \le 3$ are $x \le -4.0$ or $x \ge 0.0$.

(b) When $-4.0 < x < 0.0$, the corresponding part of the graph of $y=-x^2-4x+3$ lies above the line $y=3$.

$\therefore$ The solutions of $-x^2-4x+3 > 3$ are $-4.0 < x < 0.0$.




2. Draw the straight line $y=2$ on the graph of $y=-x^2-6x-5$.

When $x \le -4.4$ or $x \ge -1.6$, the corresponding part of the graph of $y=-x^2-6x-5$ lies on or below the line $y=2$.

$\therefore$ The solutions of $-x^2-6x-5 \le 2$ are $x \le -4.4$ or $x \ge -1.6$.

3. (a) Put $x=2, y=a$,

$a=-2^2-2=-6$

(b) $y=(-6)+6=0$

Add $y=0$ to the graph.

From the graph,

the solutions of $-x^2-x>0$ is $-1<x<0$.

4. B

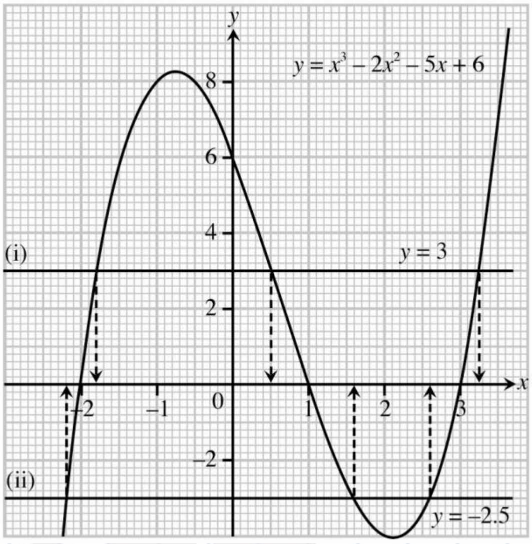
5. (a) (i) $x^3-2x^2-5x\ge 0$

$x^3-2x-5x+6\ge 6$

(ii) By (a) (i), draw the straight line $y=6$ on the graph of $y=x^3-2x^2-5x+6$.

When $-1.5\le x\le 0.0$ or $x\ge 3.4$, the corresponding part of the graph of $y=x^3-2x^2-5x+6$ lies on or above the line $y=6$.

$\therefore$ The solutions of $x^3-2x^2-5x\ge 0$ are $-1.5\le x\le 0.0$ or $x\ge 3.4$.




(b) (i) $x^3-2x^2-5x+3\le 0$

$x^3-2x^2-5x+6\le 3$

Draw the straight line $y=3$ on the graph of $y=x^3-2x^2-5x+6$.

When $x\le -1.8$ or $0.5\le x\le 3.2$, the corresponding part of the graph of $y=x^3-2x^2-5x+6$ lies on or below the line $y=3$.

$\therefore$ The solutions of $x^3-2x^2-5x+3\le 0$ are $x\le -1.8$ or $0.5\le x\le 3.2$.

(ii) $x^3-2x^2-5x+8\le -0.5$

$x^3-2x^2-5x+6\le -2.5$

Draw the straight line $y=-2.5$ on the graph of $y=x^3-2x^2-5x+6$.

When $x\le -2.2$ or $1.6\le x\le 2.6$,
The corresponding part of the graph of $y=x^3-2x^2-5x+6$ lies on or below the line $y=-2.5$.

$\therefore$ The solutions of $x^3-2x^2-5x+8\le -0.5$ are $x\le -2.2$ or $1.6\le x\le 2.6$.

6. (a) Let $f(x)=a(x-2)(x-5)$ where $a$ is a constant.

Sub. $(0,5)$, we have

$5=a(-2)(-5)$

$a=\frac{1}{2}$

$\therefore\ f(x)=\frac{1}{2}(x-2)(x-5)$

When $x=8$, $f(8)=9$.

$$\therefore\ g(x)=\left(\frac{9-5}{8-0}\right)x+5$$
$$=\frac{1}{2}x+5$$

(b) (i) $x<2$ or $x>5$

(ii) $0<x<8$

7. (a) $\begin{cases} y=-x^2+4x+4 \\ y=-x-2 \end{cases}$

By solving, $x=-1$ or $x=6$.

When $x=-1$, $g(-1)=-1$.

When $x=6$, $g(6)=-8$.

$\therefore\ A(-1,-1)$ and $B(6,-8)$

$$f(x)=-x^2+4x+4$$
$$=-(x^2-4x)+4$$
$$=-(x-2)^2+8$$

$\therefore\ C(2,8)$

(b) For $f(x)\geq g(x)$, the range of $x$ is $-1\leq x\leq 6$.

Thus, the values of $k$ such that $f(x)=k$ has only one real roots for $-1\leq x\leq 6$ are $k=8$ or $-8\leq k<-1$.

**Part 8 – Special Quadratic Equation (Exponential)**

1. $5^x=3$ or $5^x=-\frac{7}{2}$ (rej.)

$$x=\frac{\log 3}{\log 5}=0.683$$

3. $3^{2x}=1.2749$ or $3^{2x}=-6.2749$ (rej.)

$$x=\frac{\log 1.2749}{2\log 3}=0.111$$

**Part 9 – Special Quadratic Equation (Logarithm)**

1. $\log[(3x+7)(x-4)] = \log(x+2)$

$$3x^2 - 5x - 28 = x + 2$$
$$x^2 - 2x - 10 = 0$$
$$x = 4.32 \text{ or } -2.32 (rej.)$$

**Reminder:**
**log 入面一定係正數！**

3. $[\log(x-1) - 2][\log(x-1) + 1] = 0$

$\log(x-1) = 2 \text{ or } -1$

$x - 1 = 100 \text{ or } 0.1$

$x = 101 \text{ or } 1.1$

**Part 10 – Special Quadratic Equation (Trigo)**

1. $(\sin\theta + \cos\theta)^2 = 0$

$$\sin\theta + \cos\theta = 0$$
$$\tan\theta = -1$$
$$\theta = 135° \text{ or } 315°$$

3. $5\cos\theta + \sin^2\theta = 0$

$5\cos\theta + 1 - \cos^2\theta = 0$

$$\cos\theta = -0.19258 \text{ or } 5.19258 (rej.)$$
$$\theta = 101.1° \text{ or } 258.9°$$