

1a)

$$f(x) = (x+3)(x+2)(x-1)$$

Crosses  $x$  when  $y=0$

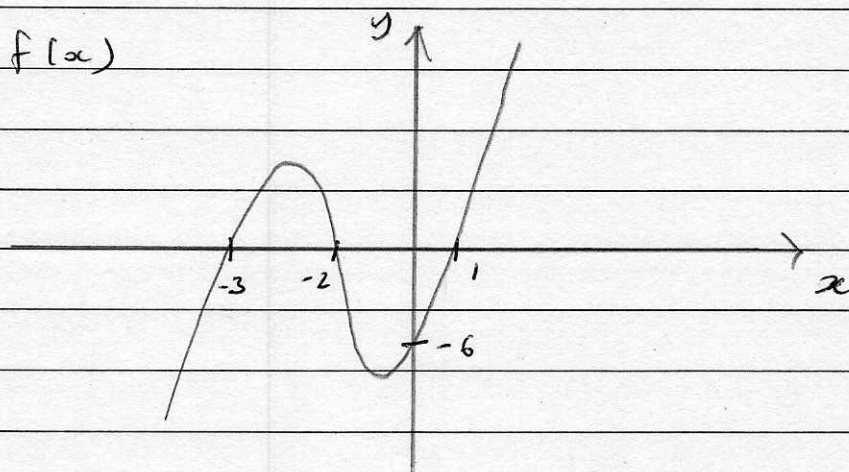
$$(x+3)(x+2)(x-1) = 0$$

$$x = -3 \quad x = -2 \quad x = 1$$

crosses  $y$  when  $x=0$

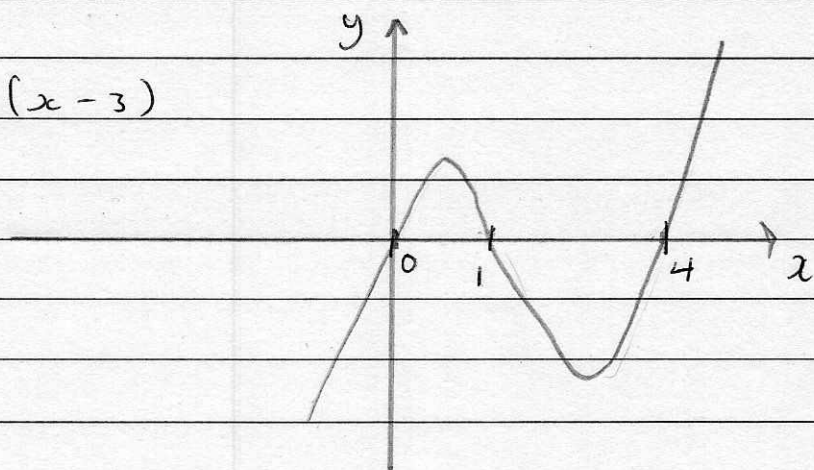
$$y = (3)(2)(-1) = \underline{\underline{-6}}$$

$$y = f(x)$$



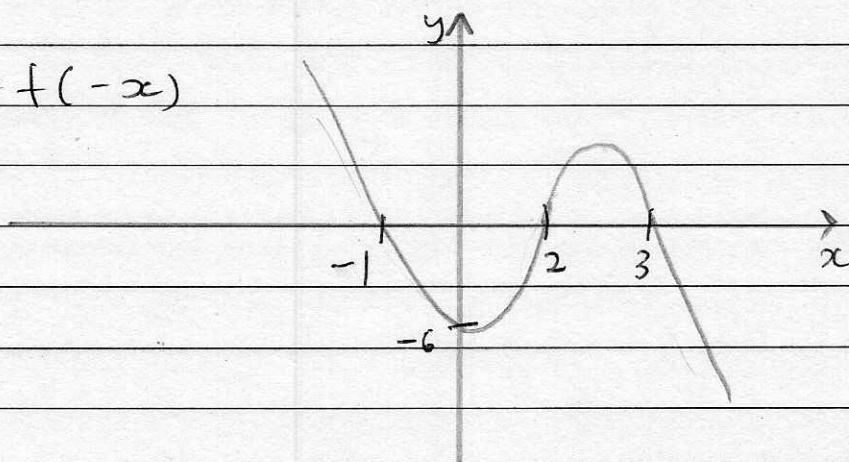
bi/

$$y = f(x-3)$$



ii/

$$y = f(-x)$$



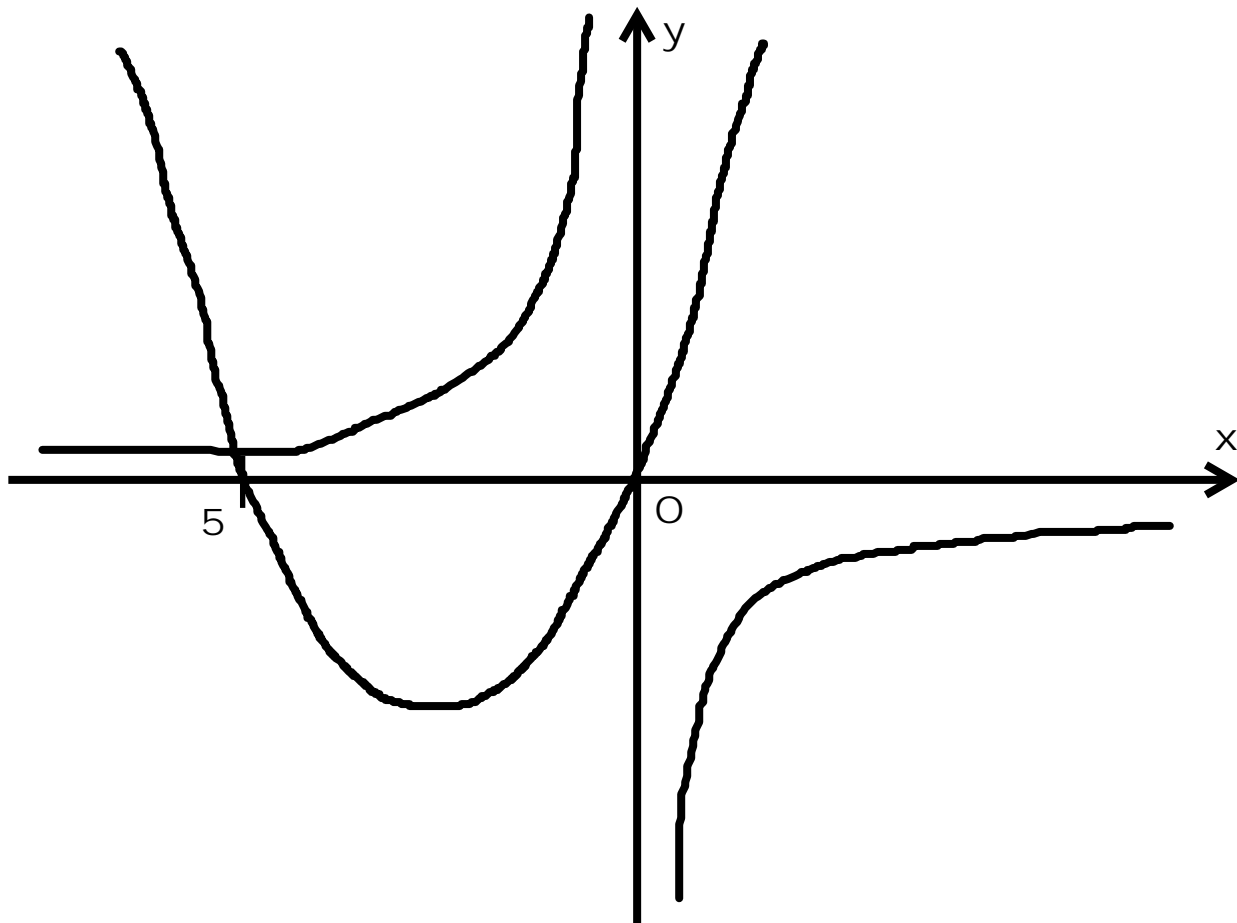
2a)

$$y = x^2 + 5x$$

$$y = x(x + 5)$$

crosses x when  $y=0$   $x(x+5) = 0$

$$x=0 \quad x=-5$$



b/

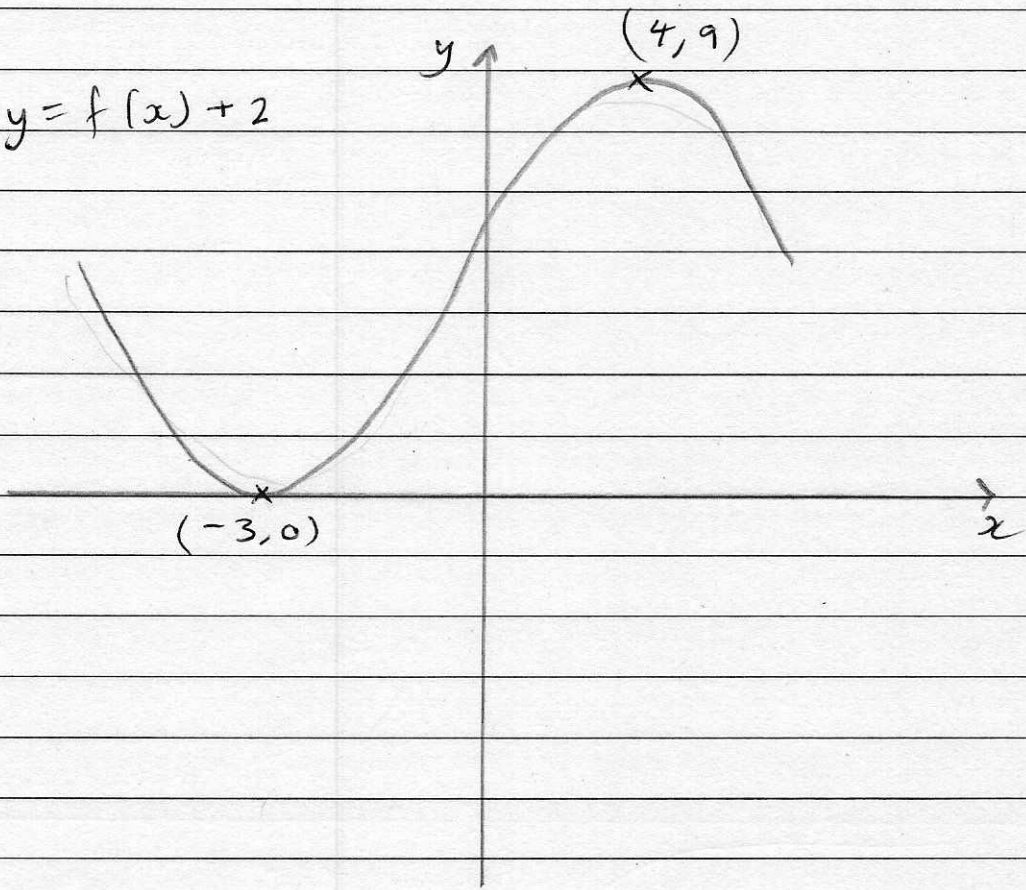
$$x^2 + 5x + \frac{1}{x} = 0$$

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

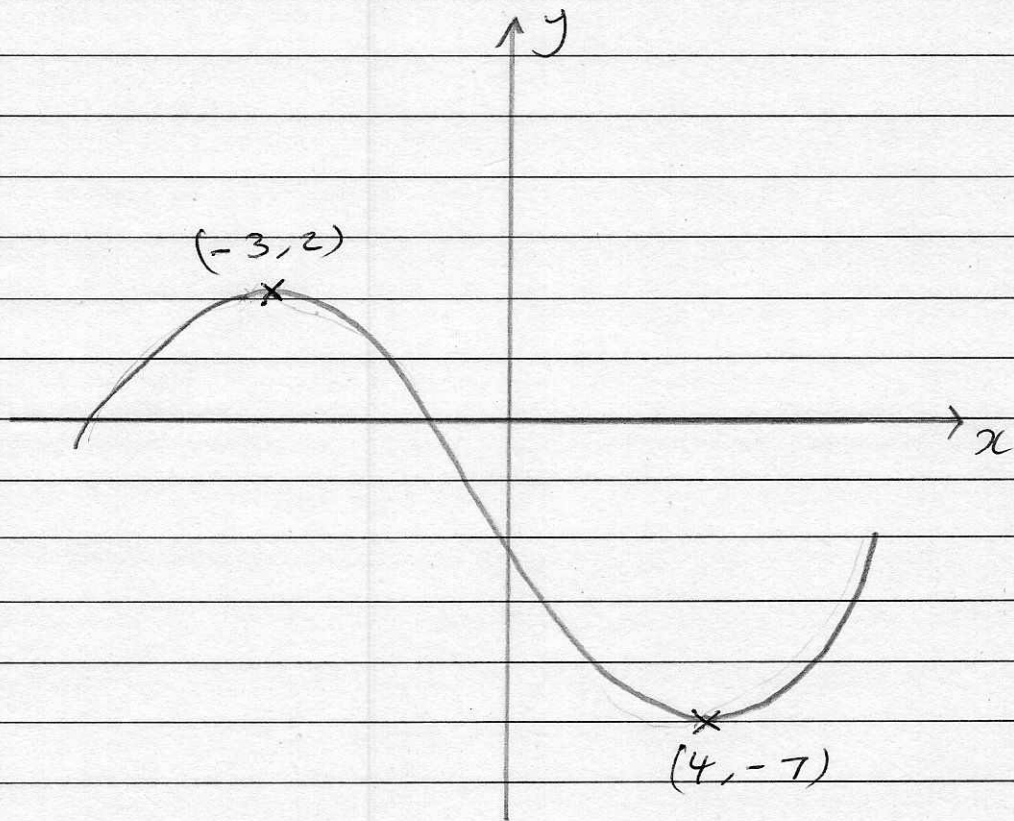
There is one solution as the graph intersects once.

3 i)

$$y = f(x) + 2$$



ii)





4a)

$$f(x) = x^2 + 4x + 5$$

$$= (x+2)^2 - 4 + 5$$

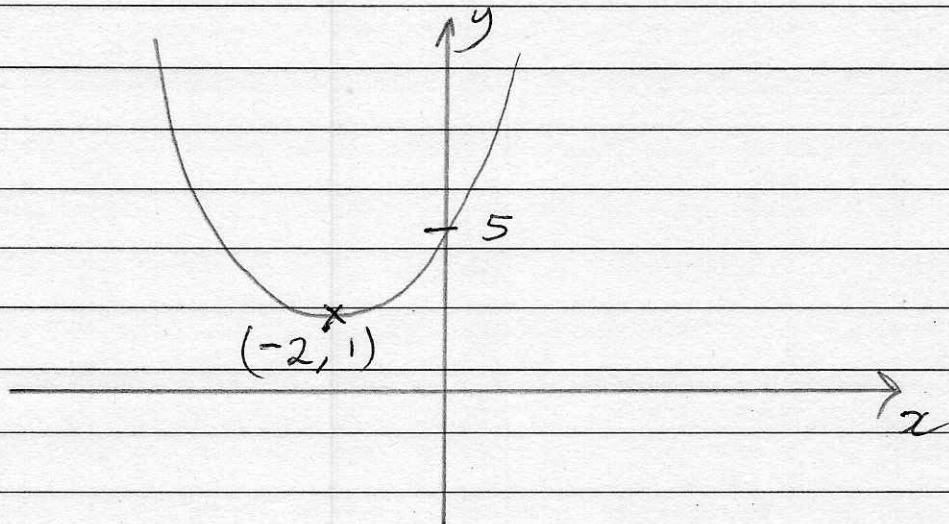
$$= (x+2)^2 + 1$$

minimum point at  $(-2, 1)$

b/

crosses y when  $x=0$

$$y = (0)^2 + 4(0) + 5$$
$$= \underline{\underline{5}}$$



c/

i/  $(2, 2)$

ii/  $(-2, 0.5)$

5a

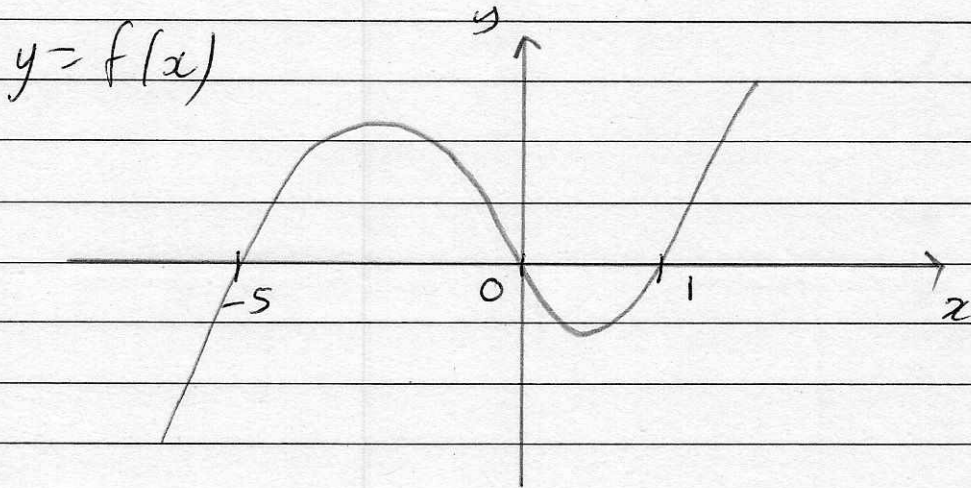
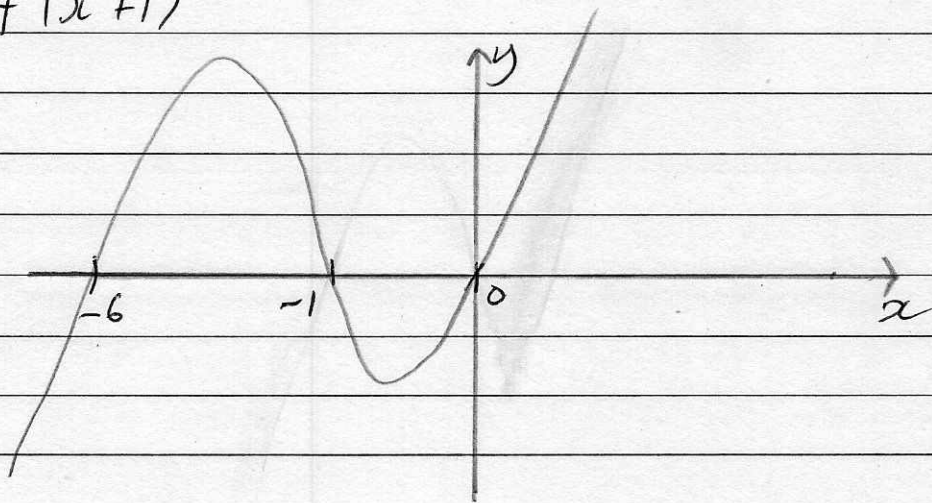
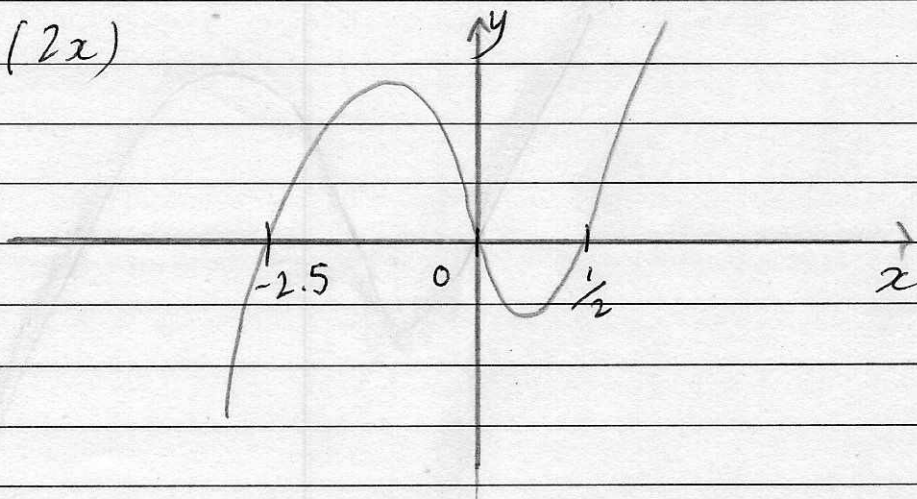
$$f(x) = x(x^2 + 4x - 5)$$

$$= x(x-1)(x+5)$$

Crosses  $x$  when  $y=0$ 

$$x(x-1)(x+5) = 0$$

$$x=0 \quad x=1 \quad x=-5$$

bi/  $y = f(x+1)$ ii/  $y = f(2x)$ 



6

$$y = \frac{1}{x} + 2$$

Crosses  $y$  when  $x = 0$  X (No solutions)

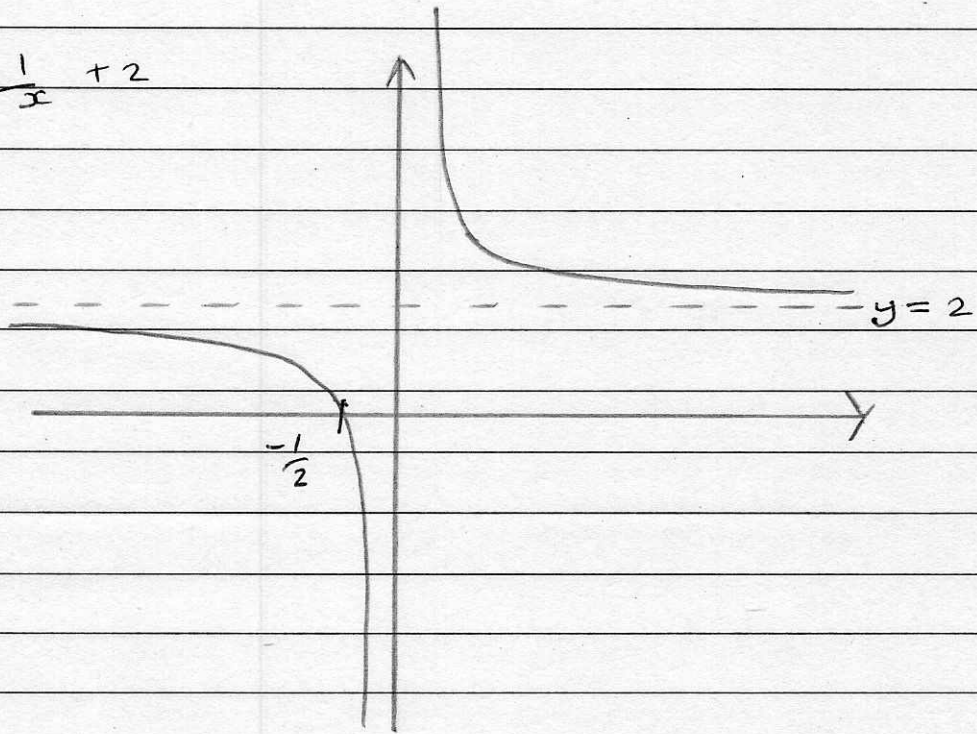
Crosses  $x$  when  $y = 0$

$$0 = \frac{1}{x} + 2$$

$$-2 = \frac{1}{x}$$

$$x = -\frac{1}{2}$$

$$y = \frac{1}{x} + 2$$



7a/

$$f(x) = (x+4)(x-1)(2-x)$$

crosses  $x$  when  $y=0$

$$0 = (x+4)(x-1)(2-x)$$

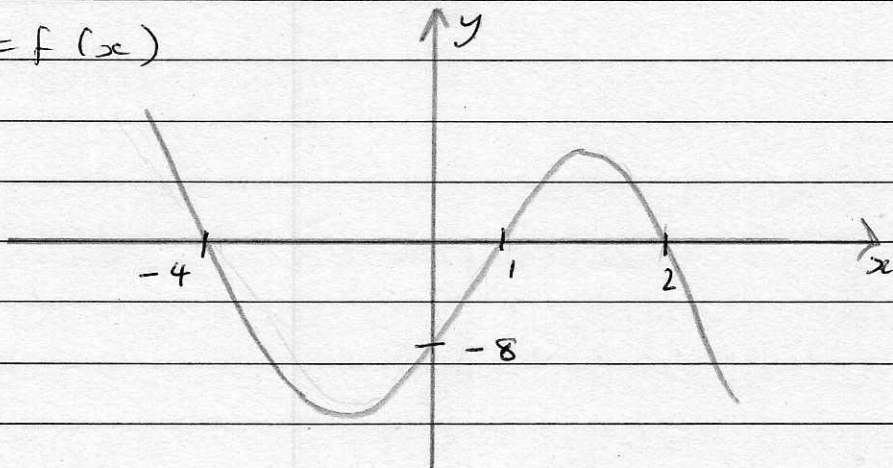
$$x = -4 \quad x = 1 \quad x = 2$$

crosses  $y$  when  $x=0$

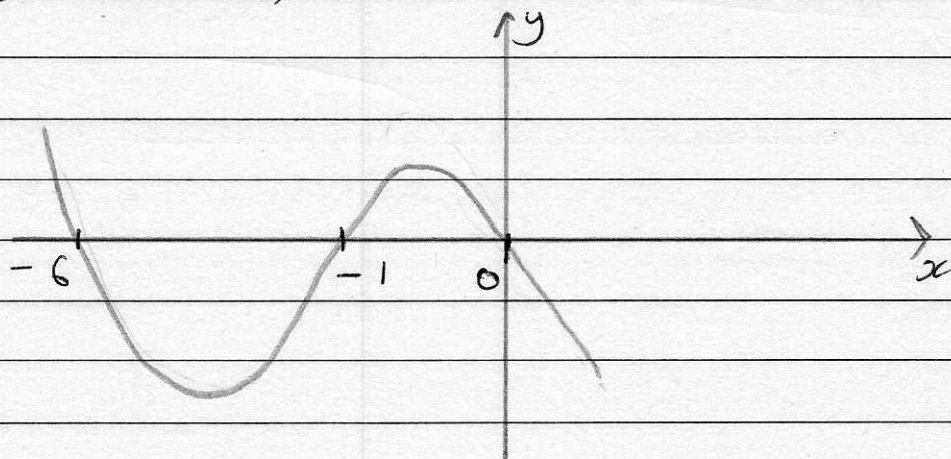
$$y = (4)(-1)(2)$$

$$= -8$$

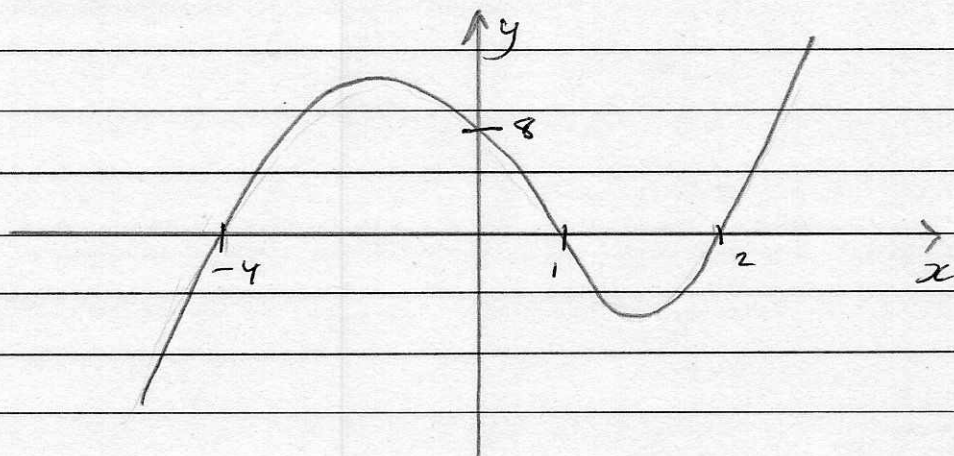
$$y = f(x)$$



b/  $y = f(x+2)$



c/  $y = -f(x)$





8)

$$f(x) = (x+3)(x-1)^2$$

crosses  $x$  when  $y=0$ 

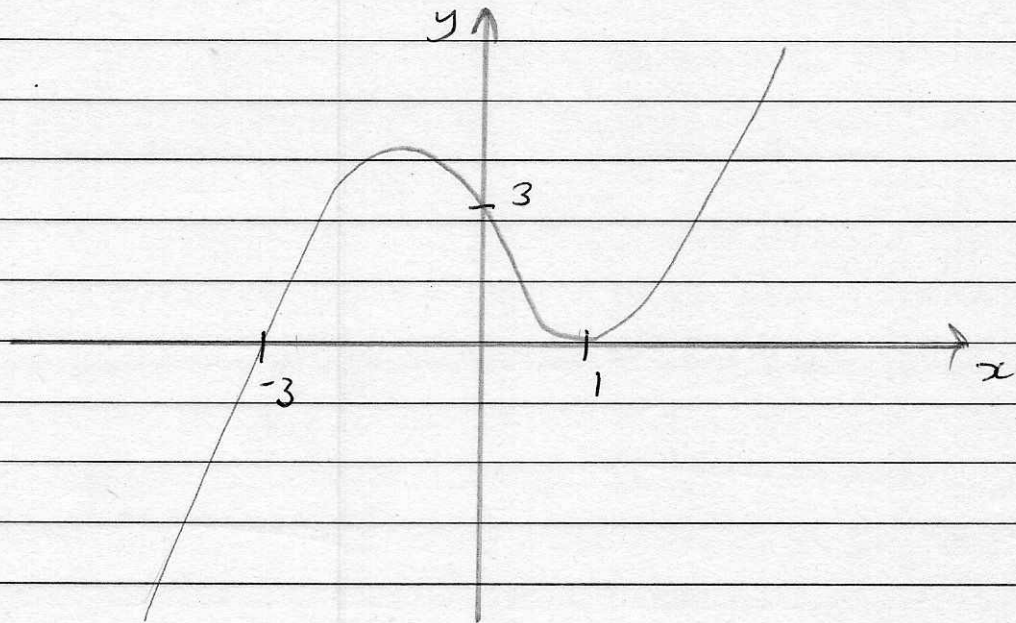
$$0 = (x+3)(x-1)^2$$

$$x = -3 \quad x = 1$$

crosses  $y$  when  $x=0$ 

$$y = (3)(-1)^2$$

$$= 3$$



b/

$$f(x+2) = (x+2+3)(x+2-1)^2$$

$$= \underline{\underline{(x+5)(x+1)^2}}$$