

$$b) f(x) = x^3 - 4x^2 + 4x \quad x^3 - 4x^2 + 4x = (x-1)^2 \quad (3)$$

$$y = 0$$

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

$$0 = x(x-2)(x-2)$$

$$x = 0 \quad \text{and} \quad x = 2$$

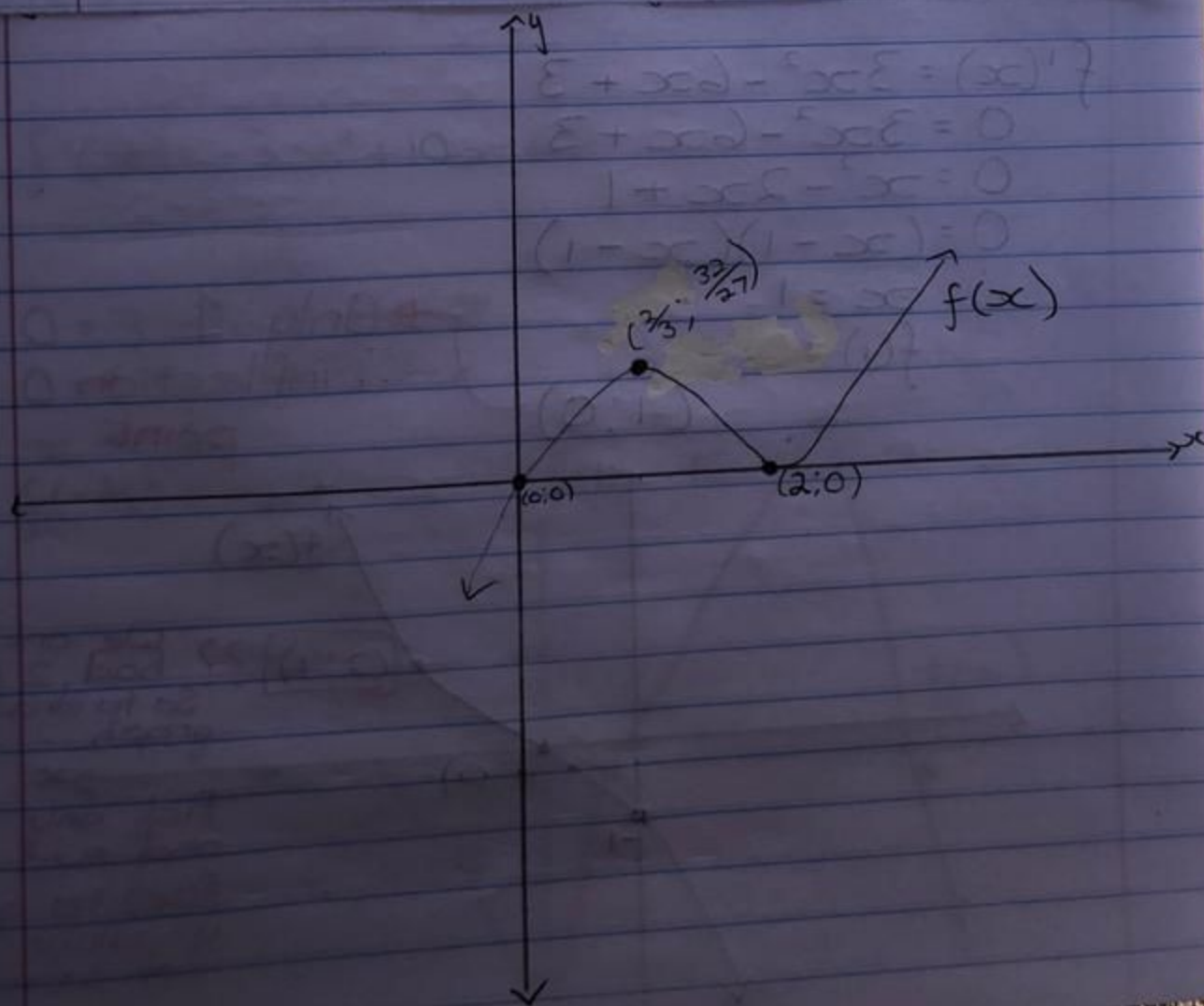
$$f'(x) = 3x^2 - 8x + 4$$

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

$$x = \frac{2}{3} \quad (0,7) \quad \text{and} \quad x = 2$$

$$f\left(\frac{2}{3}\right) = \frac{32}{27} \quad (1,2)$$

$$f(2) = 0$$



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

$$y = -1$$

$$f(1) = 0 \quad \therefore (x-1) \text{ factor}$$

$$\begin{array}{r|rrrr} 1 & 1 & -3 & +3 & -1 \\ & & 1 & -2 & 1 \\ \hline & 1 & -2 & 1 & \end{array}$$

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

$$f(x) = (x-1)(x-1)(x-1) = 0$$

$$\therefore x = 1$$

$$f'(x) = 3x^2 - 6x + 3$$

$$0 = 3x^2 - 6x + 3$$

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

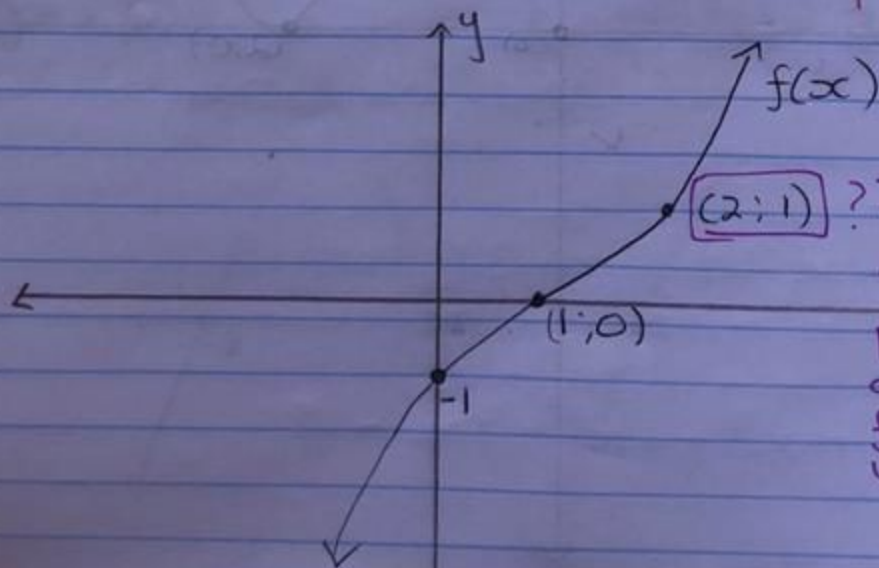
$$0 = (x-1)(x-1)$$

$$\therefore x = 1$$

$$f(1) = 0$$

$(1, 0)$

Only 1
 $\therefore$ inflection point



?? We only had 2 points
So to draw graph

Pick any x
and sub into
 $f(x)$ to get
 y -value
of coordinate

2) $f(x) = -x^3 + 5x^2 + 8x - 12$ - y-intercept

a) $f(x) = 0 \rightarrow$ get x-intercepts!!

$f(1) = 0 \therefore (x-1)$ is factor

$$\begin{array}{r|rrrr} 1 & -1 & +5 & +8 & -12 \\ & & -1 & 4 & 12 \\ \hline & -1 & +4 & +12 & \end{array}$$

$f(x) = (x-1)(-x^2 + 4x + 12)$

$0 = (x-1)$

$1 = x$

and

$-x^2 + 4x + 12 = 0$

and

$x^2 - 4x - 12 = 0$

$(x-6)(x+2) = 0$

$x = 6, x = -2$

b) $f'(x) = -3x^2 + 10x + 8$

c) $0 = 3x^2 - 10x - 8$

$0 = (3x + 2)(x - 4)$

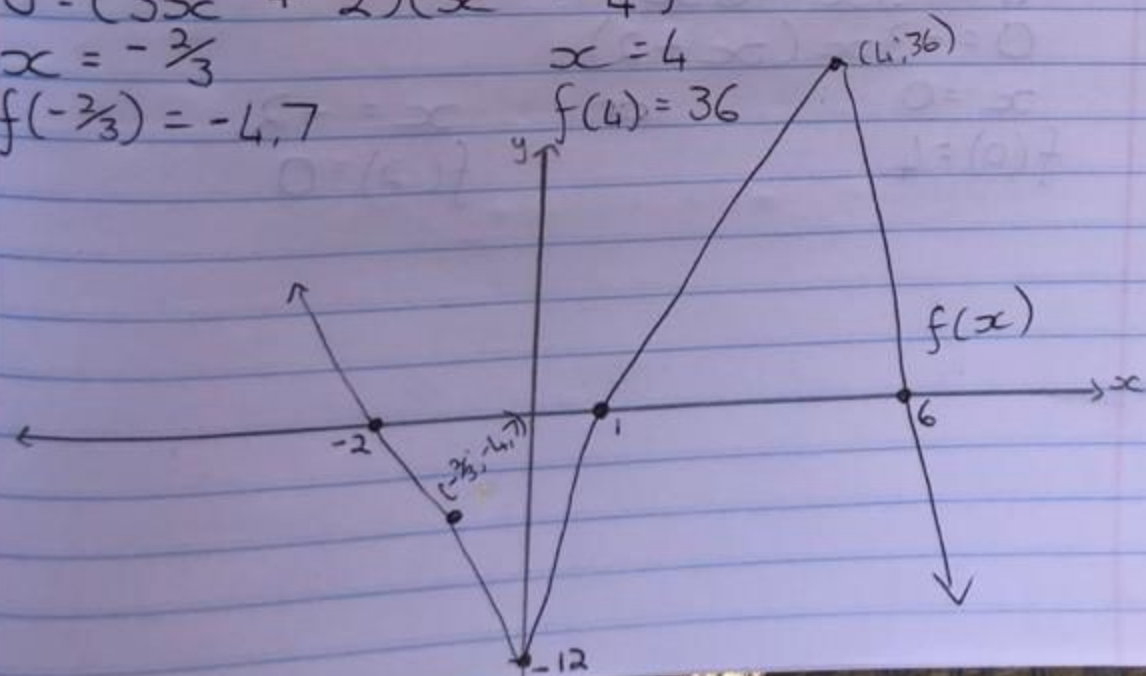
$x = -\frac{2}{3}$

$x = 4$

$f(-\frac{2}{3}) = -4.7$

$f(4) = 36$

d)



Extra's

1) $f(x) = -x^3 - 3x^2 + 4$

• $y = 4$

• $f(1) = 0 \quad \therefore (x-1)$ is factor

$$\begin{array}{r|rrrrr} 1 & -1 & -3 & +0 & +4 & \\ & & -1 & -4 & -4 & \\ \hline & -1 & -4 & -4 & & \end{array}$$

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

$$x-1=0$$

$$x=1$$

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

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

$$(x+2)(x+2) = 0$$

$$x = -2$$

• $f'(x) = -3x^2 - 6x$

$$0 = -3x^2 - 6x$$

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

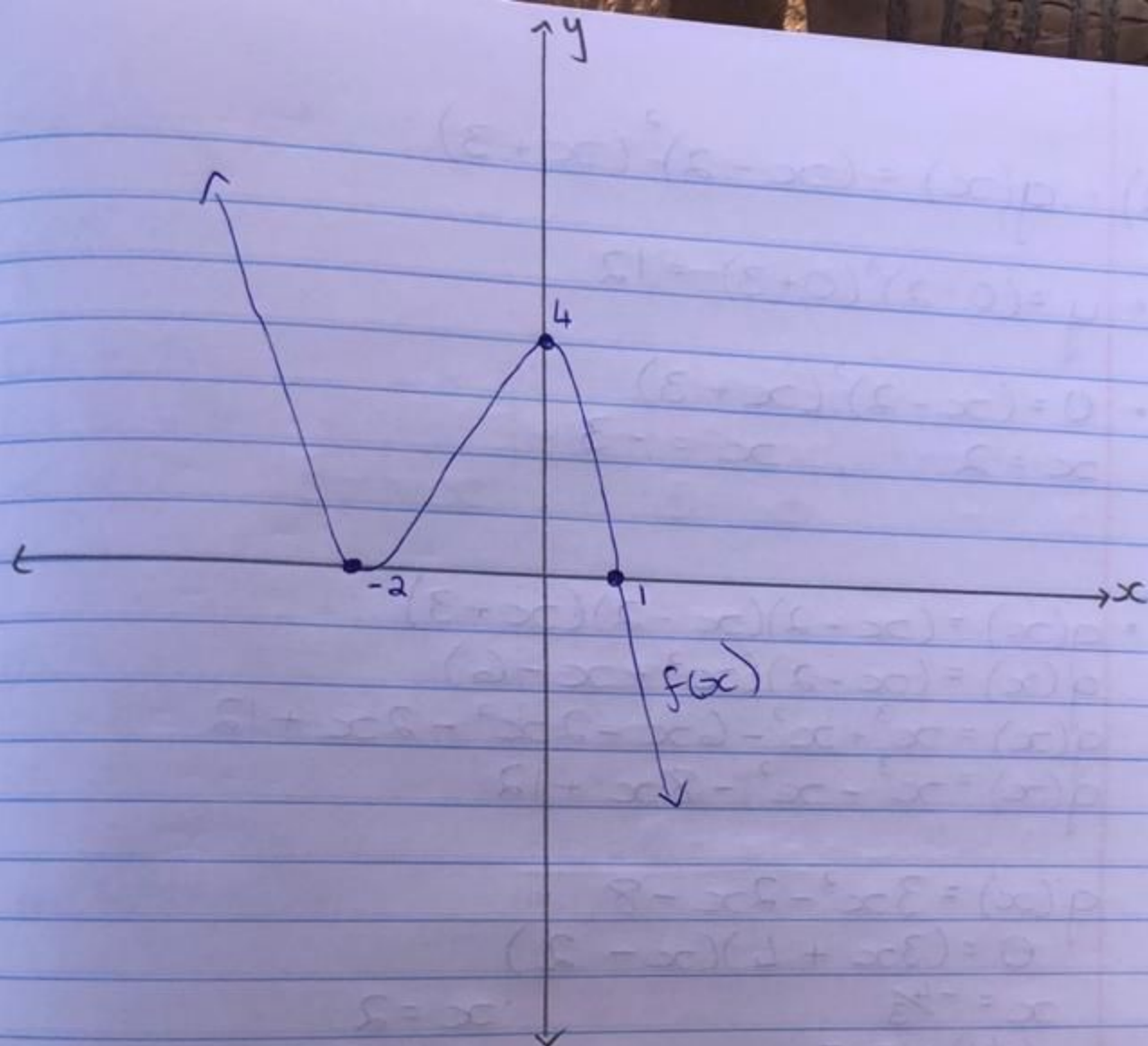
$$x = 0$$

$$f(0) = 4$$

or

$$x = -2$$

$$f(-2) = 0$$



$$2) \quad q(x) = (x-2)^2(x+3)$$

$$\bullet \quad y = (0-2)^2(0+3) = 12$$

$$\bullet \quad 0 = (x-2)^2(x+3)$$

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

$$\bullet \quad q(x) = (x-2)(x-2)(x+3)$$

$$q(x) = (x-2)(x^2+x-6)$$

$$q(x) = x^3 + x^2 - 6x - 2x^2 - 2x + 12$$

$$q(x) = x^3 - x^2 - 8x + 12$$

$$q'(x) = 3x^2 - 2x - 8$$

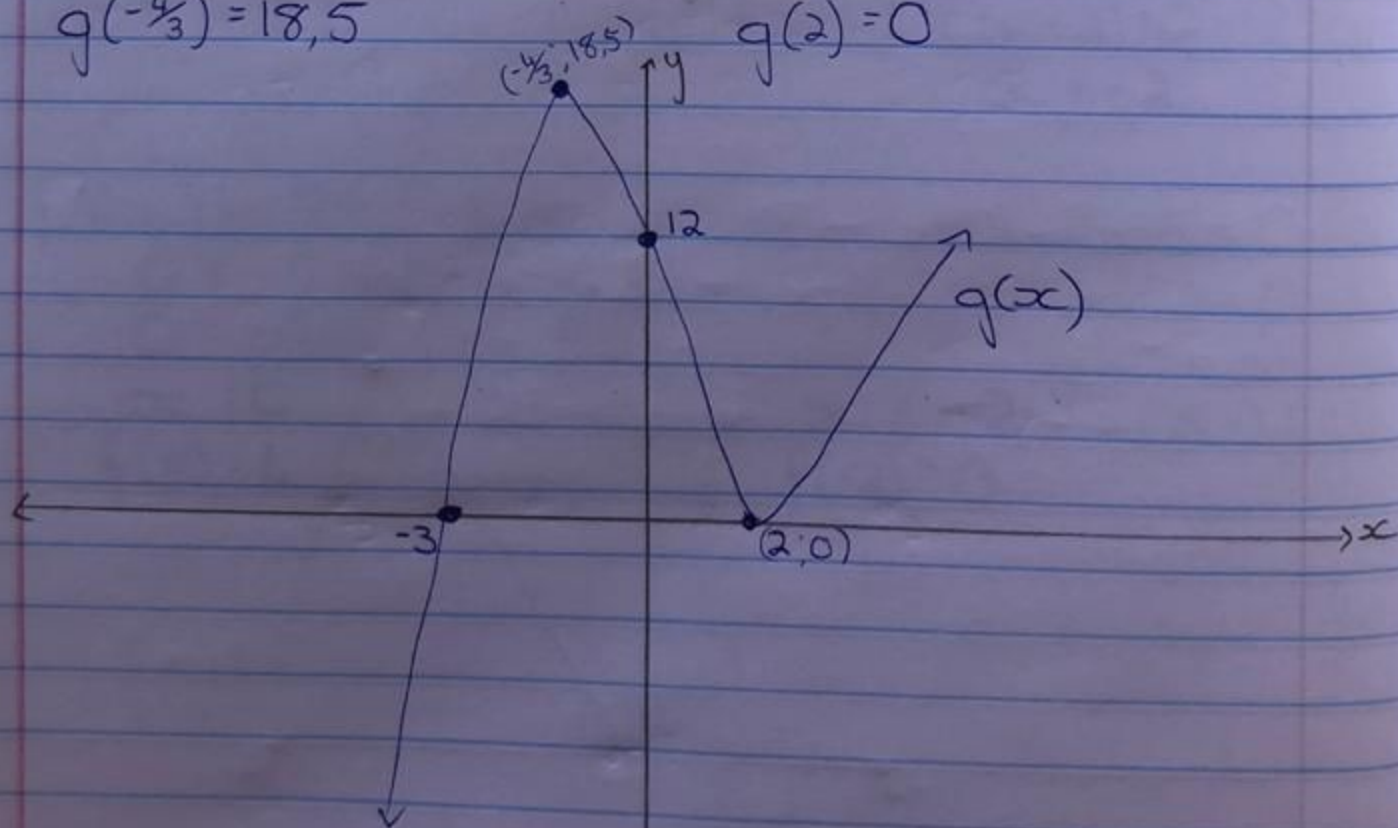
$$0 = (3x+4)(x-2)$$

$$x = -\frac{4}{3}$$

$$x = 2$$

$$q(-\frac{4}{3}) = 18,5$$

$$q(2) = 0$$



$$3) m(x) = x^3 - 11x^2 + 24x$$

$$\bullet y = 0$$

$$\bullet 0 = x(x^2 - 11x + 24)$$

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

$$x = 0, \quad x = 8, \quad x = 3$$

$$\bullet m'(x) = 3x^2 - 22x + 24$$

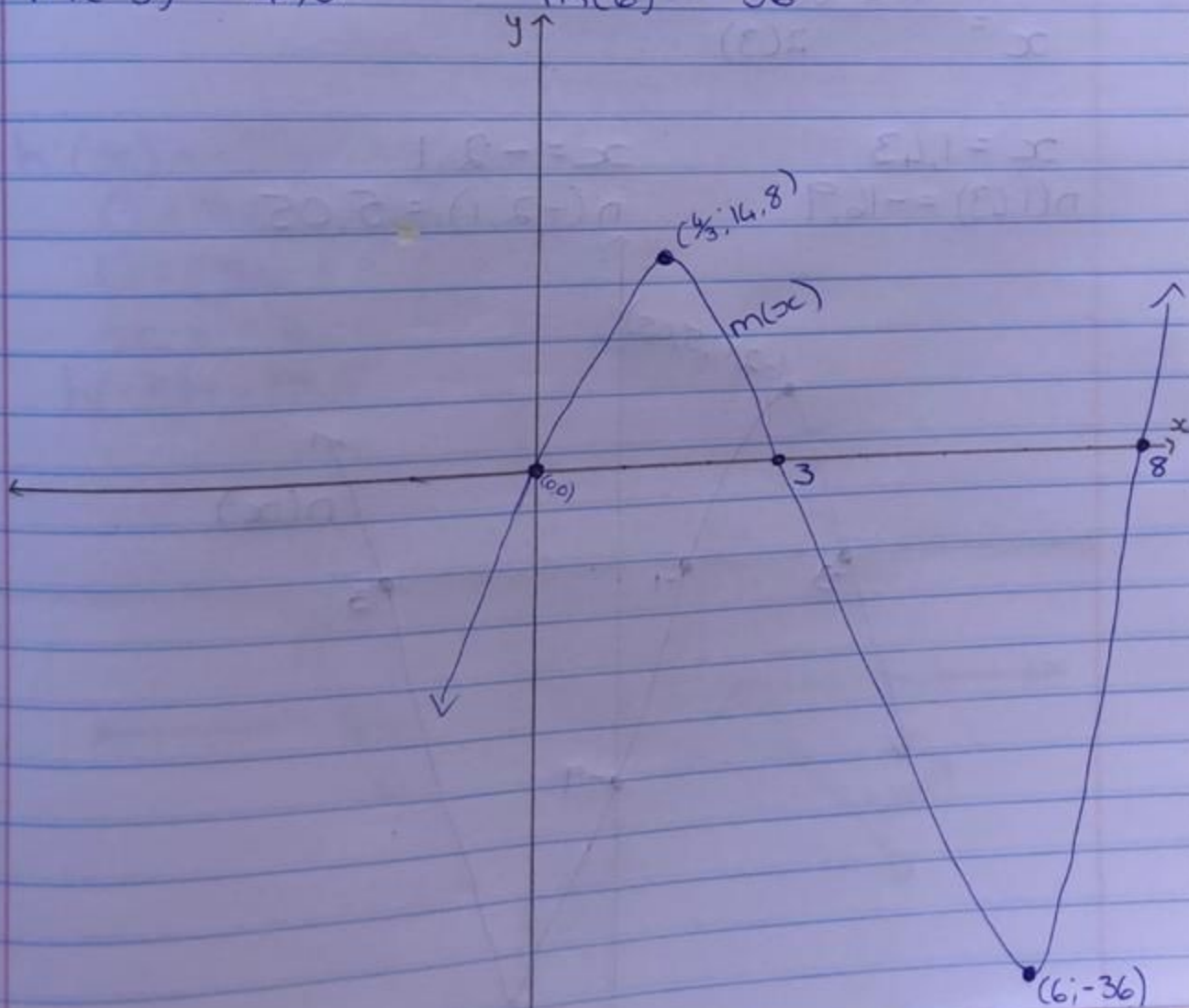
$$0 = 3x^2 - 22x + 24$$

$$0 = (3x - 4)(x - 6)$$

$$x = \frac{4}{3}, \quad x = 6$$

$$m(\frac{4}{3}) = 14,8$$

$$m(6) = -36$$



$$4) n(x) = (x+1)(x^2-9)$$

$$\bullet y = (0+1)(0-9) = -9$$

$$\bullet 0 = (x+1)(x^2-9)$$

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

$$x = -1, x = 3, x = -3$$

$$\bullet n(x) = (x+1)(x^2-9)$$

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

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

$$n'(x) = 3x^2 + 2x - 9$$

$$0 = 3x^2 + 2x - 9$$

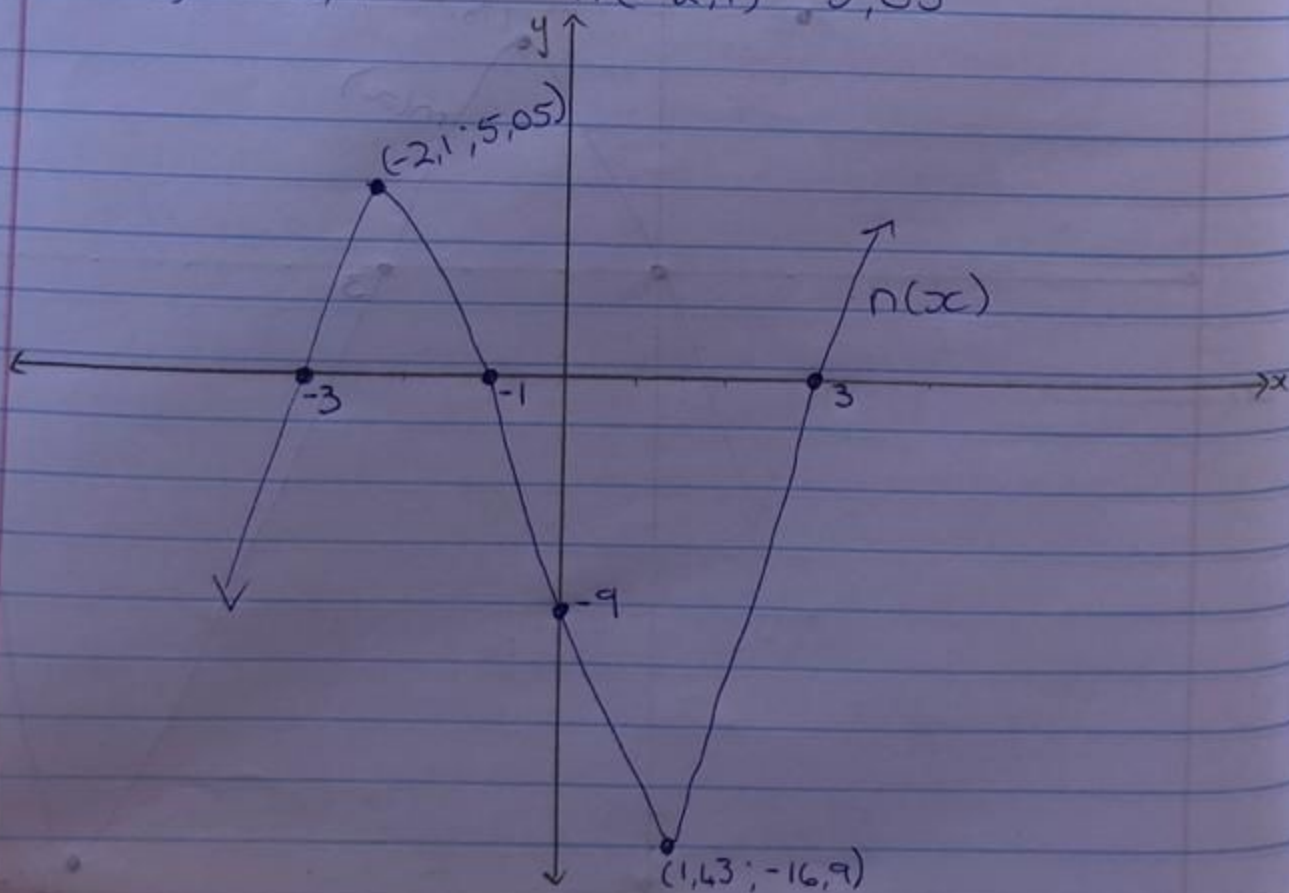
$$x = \frac{-2 \pm \sqrt{(2)^2 - 4(3)(-9)}}{2(3)}$$

$$x = 1,43$$

$$n(1,43) = -16,9$$

$$x = -2,1$$

$$n(-2,1) = 5,05$$



$$5) h(x) = -x^3 + 4x^2 + 3x - 18$$

$$\bullet y = -18$$

$$\bullet h(-2) = 0$$

$x+2$ is factor

$$\begin{array}{r} -2 \overline{) -1 + 4 + 3 - 18} \\ \underline{2 \quad -12 \quad 18} \\ -1 \quad 6 \quad -9 \end{array}$$

$$h(x) = (x+2)(-x^2 + 6x - 9)$$

$$x+2=0$$

$$x = -2$$

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

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

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

$$x = 3$$

$$\bullet h'(x) = -3x^2 + 8x + 3$$

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

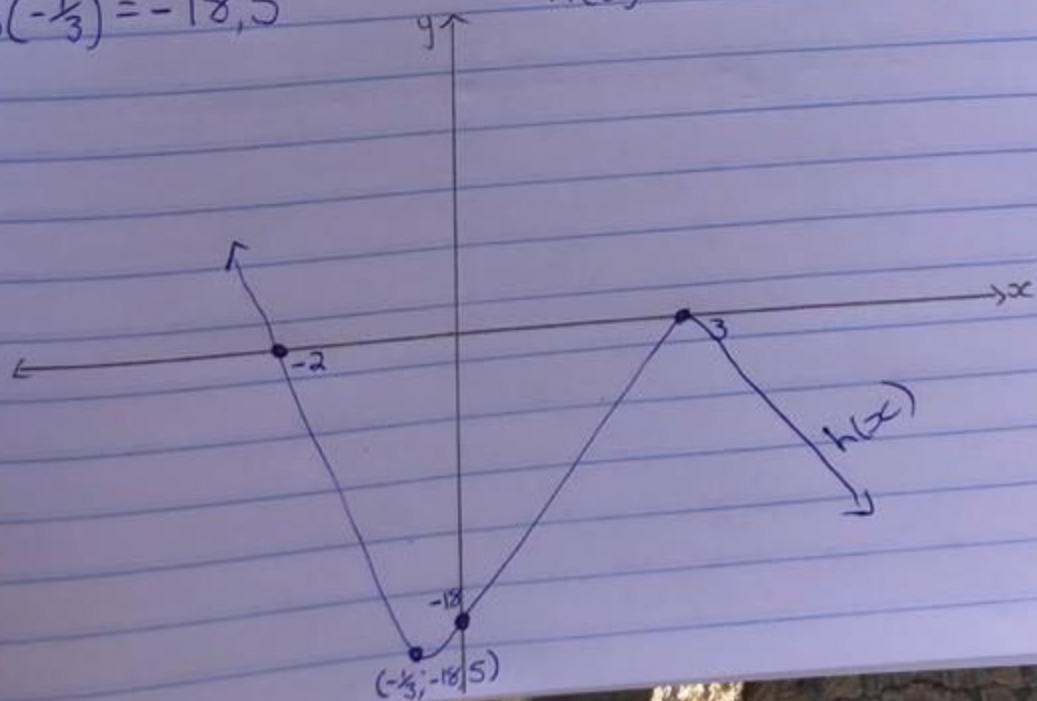
$$0 = (3x+1)(x-3)$$

$$x = -\frac{1}{3}$$

$$h(-\frac{1}{3}) = -18,5$$

$$x = 3$$

$$h(3) = 0$$



Homework - Memo's

* Textbook q's

1a) $f(x) = x^3 - 4x$

$$y = 0$$

$$0 = x^3 - 4x$$

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

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

$$x = 0, x = 2, x = -2$$

$$f'(x) = 3x^2 - 4$$

$$0 = 3x^2 - 4$$

$$4 = 3x^2$$

$$\pm \sqrt{\frac{4}{3}} = \sqrt{x^2}$$

$$x = \frac{2}{\sqrt{3}} / 1,15 \quad \text{and}$$

$$f\left(\frac{2}{\sqrt{3}}\right) = -3,08$$

$$x = -\frac{2}{\sqrt{3}} / -1,15$$

$$f\left(-\frac{2}{\sqrt{3}}\right) = 3,08$$

