

CALCULUS GRAPH NOTES

1. Given: $f(x) = x^3 + 4x^2 - 7x - 10$

1.1 Write down the y -intercept of f . (1)

1.2 Show that 2 is a root of the equation $f(x) = 0$. (2)

1.3 Hence, factorise $f(x)$ completely. (3)

1.4 If it is further given that the coordinates of the turning points are approximately at $(0,7 ; -12,6)$ and $(-3,4 ; 20,8)$, draw a sketch graph of f and label all intercepts and turning points. (3)

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| 8.1 | $y = -10$ |
| 8.2 | $f(x) = x^3 + 4x^2 - 7x - 10$ $f(2) = 2^3 + 4(2)^2 - 7(2) - 10 = 0$ |
| 8.3 | $f(x) = (x-2)(x^2 + 6x + 5)$ $f(x) = (x-2)(x+5)(x+1)$ |
| 8.4 | <p>The graph shows a cubic curve with the following features:</p> <ul style="list-style-type: none"> Y-intercept: The curve passes through the point $(0, 7)$. Local Maximum: The curve reaches a local maximum at the point $(-3.4, 20.8)$. Local Minimum: The curve reaches a local minimum at the point $(0.7, -12.6)$. Roots: The curve intersects the x-axis at three distinct points. One root is located to the left of $x = -5$. Another root is between $x = -1$ and $x = 0$. The third root is located to the right of $x = 2$. |

2. Given: $h(x) = f'(x) = 3x^2 + 8x - 7$

Sketch the above graph.

X-intercept put $y=0$

$$3x^2 + 8x - 7 = 0$$

$$x = \frac{-8 \pm \sqrt{(8)^2 - 4(3)(-7)}}{2(3)}$$

$$= \frac{-8 \pm \sqrt{64 + 84}}{6}$$

$$= \frac{-8 \pm \sqrt{148}}{6}$$

$$x = -3.36 \quad \text{or} \quad x = 0.69$$

$$x = -3.34 \quad \text{or} \quad x = 0.7$$

Y intercept put $x=0$

$$y = -7$$

Axis of symmetry

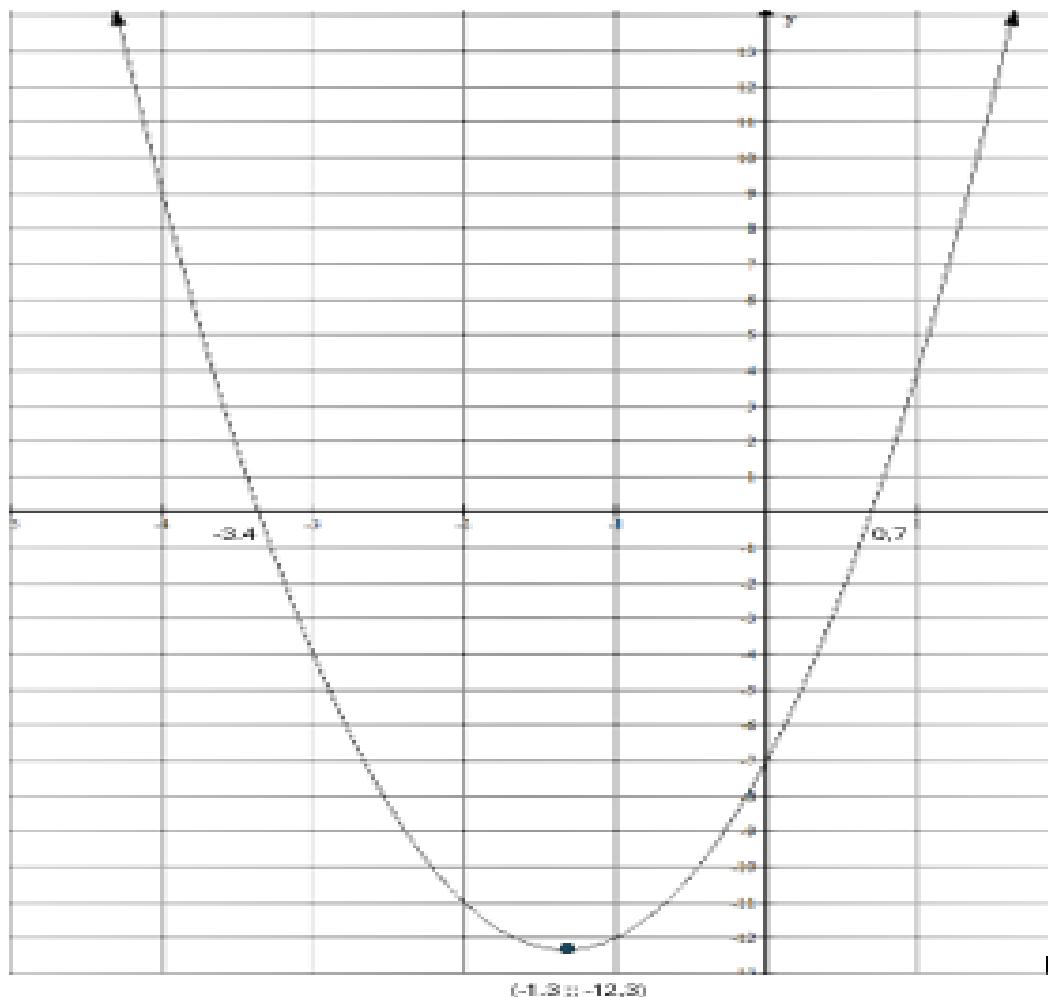
$$x = \frac{-b}{2a}$$

$$= \frac{-8}{2(3)}$$

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

Turning point

$$h\left(\frac{-4}{3}\right) = -12.3$$



$$h(x) = f''(x) = 6x + 8$$

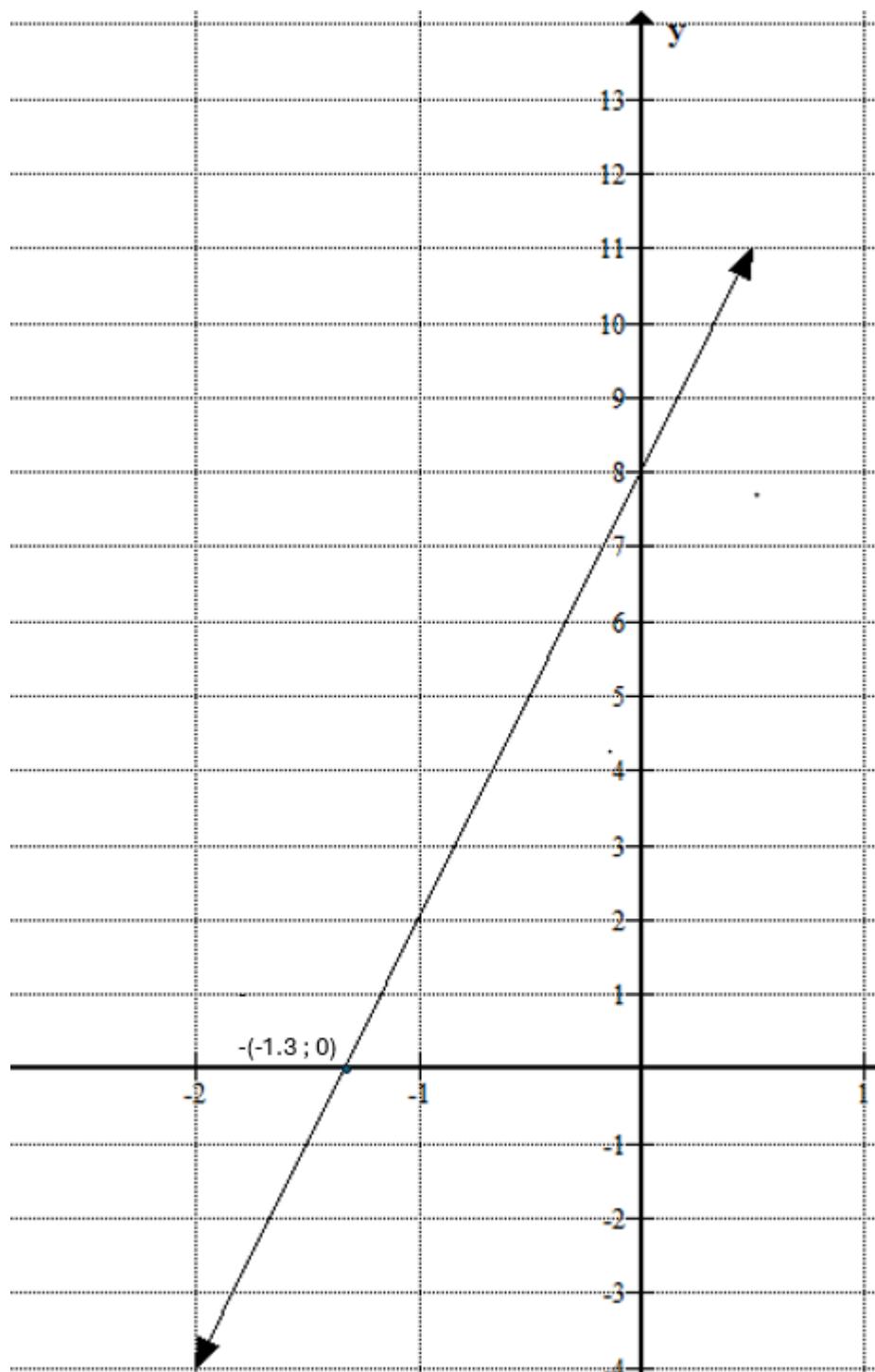
X-intercept put $y=0$

$$6x + 8 = 0$$

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

Y -intercept put $x=0$

$$Y = 8$$



THE DERIVATIVE OF A CUBIC FUNCTION

The derivative of a cubic function is a quadratic function:

