

$$\textcircled{1} \quad \lim_{h \rightarrow 0} \frac{2(x+h)^2 - 3 - (2x^2 - 3)}{h}$$

$$\lim_{h \rightarrow 0} \frac{2(x^2 + 2xh + h^2) - 3 - 2x^2 + 3}{h}$$

$$\lim_{h \rightarrow 0} \frac{2x^2 + 4xh + 2h^2 - 3 - 2x^2 + 3}{h}$$

$$\lim_{h \rightarrow 0} \frac{4xh + 2h^2}{h}$$

$$\lim_{h \rightarrow 0} \frac{h(4x + 2h)}{h}$$

$$\lim_{h \rightarrow 0} 4x + 2h = 4x + 2(0) = 4x$$

$$\textcircled{2} \quad f'(x) = 0 \quad \textcircled{3} \quad f'(x) = 12x^3 + 12x^2$$

$$\textcircled{4} \quad \begin{aligned} &\text{First rewrite } f(x) \text{ to } f(x) = 3x^{-4} - x^{\frac{1}{2}} + 7x + 12 \\ &f'(x) = -12x^{-5} - \frac{1}{2}x^{-\frac{3}{2}} + 7 \end{aligned}$$

$$\textcircled{5} \quad \begin{aligned} &\text{First rewrite } g(x) \text{ to } g(x) = 2x + 4x^{-1} \\ &g'(x) = 2 - 4x^{-2} \end{aligned}$$

$$\textcircled{6} \quad g'(x) = 10 - 4x$$

$$g'(3) = 10 - 4(3) = -2 = \text{slope}$$

⑦ Find slope $f'(x) = 3x^2 - 1$

$$f'(2) = 3(2)^2 - 1 = 11$$

So... $m = 11$ $(3, 12)$

$$y - 12 = 11(x - 3)$$

$$y - 12 = 11x - 33$$

$$y = 11x - 21$$

⑧ $f'(x) = 3x^2 - 8x + 4$

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

$$\begin{array}{ccccccc} + & \bullet & - & \bullet & + \\ \hline 0 & 1 & 2 \end{array}$$

inc: $x < \frac{2}{3}, x > 2$

dec: $\frac{2}{3} < x < 2$

$$\max\left(\frac{2}{3}, \frac{32}{27}\right)$$

$$\min(2, 0)$$

$$f''(x) = 6x - 8$$

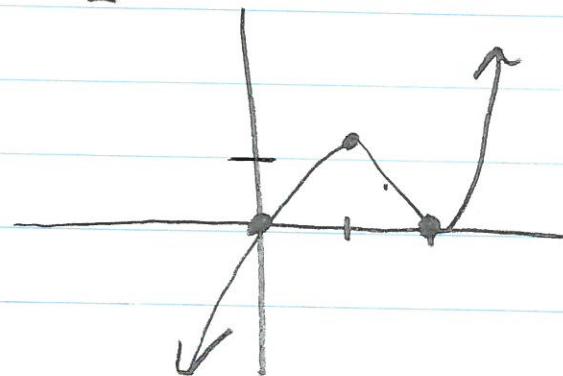
$$0 = 2(3x-4)$$

$$\begin{array}{ccccc} - & \bullet & + & & \\ \hline 1 & 2 \end{array}$$

ccu: $x > \frac{4}{3}$

ccd: $x < \frac{4}{3}$

$$\text{poi} \left(\frac{4}{3}, \frac{16}{27}\right)$$



$$\textcircled{9} \quad f'(x) = 12x^3 - 12x^2$$

$$O = 12x^2(x-1)$$

$$\begin{array}{c} \downarrow \\ 0 \end{array} \quad \begin{array}{c} \uparrow \\ 1 \end{array}$$

$$\begin{array}{c} - \quad + \\ - \quad + \end{array}$$

$$\begin{array}{c} 0 \quad 1 \end{array}$$

inc: $x > 1$

dec: $x < 1$

min $(1, -1)$

$$f''(x) = 36x^2 - 24x$$

$$O = 12x(3x-2)$$

$$\begin{array}{c} \downarrow \\ 0 \end{array} \quad \begin{array}{c} \uparrow \\ \frac{2}{3} \end{array}$$

$$\begin{array}{c} - \quad + \quad + \quad + \\ - \quad + \quad 1 \end{array}$$

$$\begin{array}{c} 0 \quad 1 \end{array}$$

ccu: $x < 0, x > \frac{2}{3}$

ccd: $0 < x < \frac{2}{3}$

POI

$(0, 0)$
 $(\frac{2}{3}, -\frac{16}{27})$

