2-6-20 4th Trig

① $f(x) = \frac{1}{4}x^4 + \frac{1}{3}x^3$

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

② $f(x) = \frac{3}{x^2} - \frac{4}{x^3}$

Rewrite as

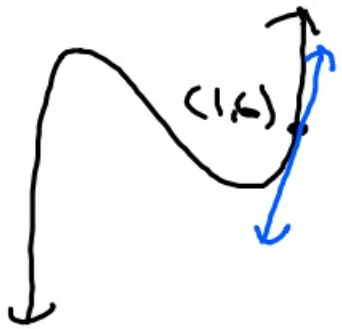
$f(x) = 3x^{-2} - 4x^{-3}$

$f'(x) = -6x^{-3} + 12x^{-4}$

OR

$\frac{-6}{x^3} + \frac{12}{x^4}$

③ What is the slope of the line that is tangent to $f(x) = 4x^3 + 2x$ at $(1,6)$.



$f'(x) = 12x^2 + 2$

$f'(1) = 12 \cdot 1^2 + 2$

$= 14$

14 is the slope

(4) Give the equation of the line that is tangent to $f(x) = x^3 + 3x^2 - 1$ at $(2, 19)$.

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

$f'(2) = 3 \cdot 2^2 + 6 \cdot 2$

$= 24$

$y - y_1 = m(x - x_1)$ $\quad m = 24$ $\quad (2, 19)$

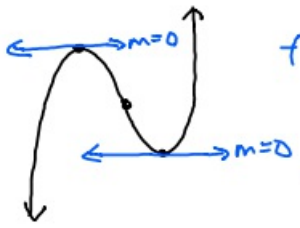
$y - 19 = 24(x - 2)$

$y - 19 = 24x - 48$

$+19 \qquad +19$

$y = 24x - 29$

(5) Find the critical points of $f(x) = x^3 + 3x^2 - 45x$



$f'(x) = 3x^2 + 6x - 45$

$3x^2 + 6x - 45 = 0$

$\frac{3(x^2 + 2x - 15)}{3} = \frac{0}{3}$

$x^2 + 2x - 15 = 0$

$(x - 3)(x + 5) = 0$

$x - 3 = 0$ $\qquad$ $x + 5 = 0$

$x = 3$ $\qquad$ $x = -5$

Plug $x = 3$ and $x = -5$ into original eq. to get the y values

$f(x) = x^3 + 3x^2 - 45x$

$f(3) = 3^3 + 3 \cdot 3^2 - 45 \cdot 3 = -81$ $\quad (3, -81)$

$f(-5) = (-5)^3 + 3(-5)^2 - 45 \cdot -5 = 175$ $\quad (-5, 175)$

Point of Inflection

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

$6x + 6 = 0$

$x = -1$

$f(-1) = (-1)^3 + 3(-1)^2 - 45(-1) = 47$

$(-1, 47)$

⑥ Find the x and y-intercept of

$f(x) = x^2 + 8x + 7$.

x-intercept

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

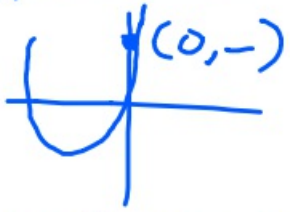
$0 = (x+7)(x+1)$

$x+7=0 \quad x+1=0$

$x=-7 \quad x=-1$

$(-7,0) \quad (-1,0)$

y-intercept



$y = 0^2 + 8 \cdot 0 + 7$

$y = 7$

$(0,7)$

⑦ Match discriminant value with graph. $\sqrt{b^2 - 4ac}$

Discriminant value

Ⓐ -6

Ⓑ 0

Ⓒ 10