2-5-20

① $f(x) = \frac{1}{4}x^4 + \frac{1}{2}x^2$

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

② What is the slope of the tangent line at $(1, 9)$ on $f(x) = x^3 + 7x - 1$?

$f'(x) = 3x^2 + 7$

$f'(1) = 3 \cdot 1^2 + 7$

$= 10$

Slope is 10.

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

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

$f'(1) = 6 \cdot 1^2 + 6 \cdot 1 = 12$

Slope = 12

$y - y_1 = m(x - x_1)$ $m = 12$ $(1, 4)$

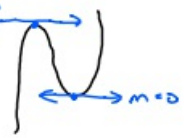
$y - 4 = 12(x - 1)$

$y - 4 = 12x - 12$

$+4 \quad +4$

$y = 12x - 8$

④ $f(x) = 2x^3 + 6x^2 + 10$



$f'(x) = 6x^2 + 12x$

$6x^2 + 12x = 0$

$6x(x+2) = 0$

$6x = 0$ $\quad x+2=0$

$x = 0$ $\quad x = -2$

$f(0) = 2\cdot 0^3 + 6\cdot 0^2 + 10 = 10$ $\quad (0, 10)$

$f(-2) = 2\cdot(-2)^3 + 6\cdot(-2)^2 + 10 = 18$ $\quad (-2, 18)$

Point of Inflection

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

$12x + 12 = 0$

$x = -1$

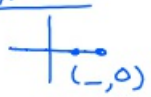
Plug $x = -1$ into the original eq.

$f(x) = 2x^3 + 6x^2 + 10$

$f(-1) = 2(-1)^3 + 6(-1)^2 + 10 = 14$ $\quad (-1, 14)$

⑤ Give the x and y-intercepts for $y = x^2 + 8x + 7$.

x-int.



y-int.

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

$y = 7$

$(0, 7)$

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

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

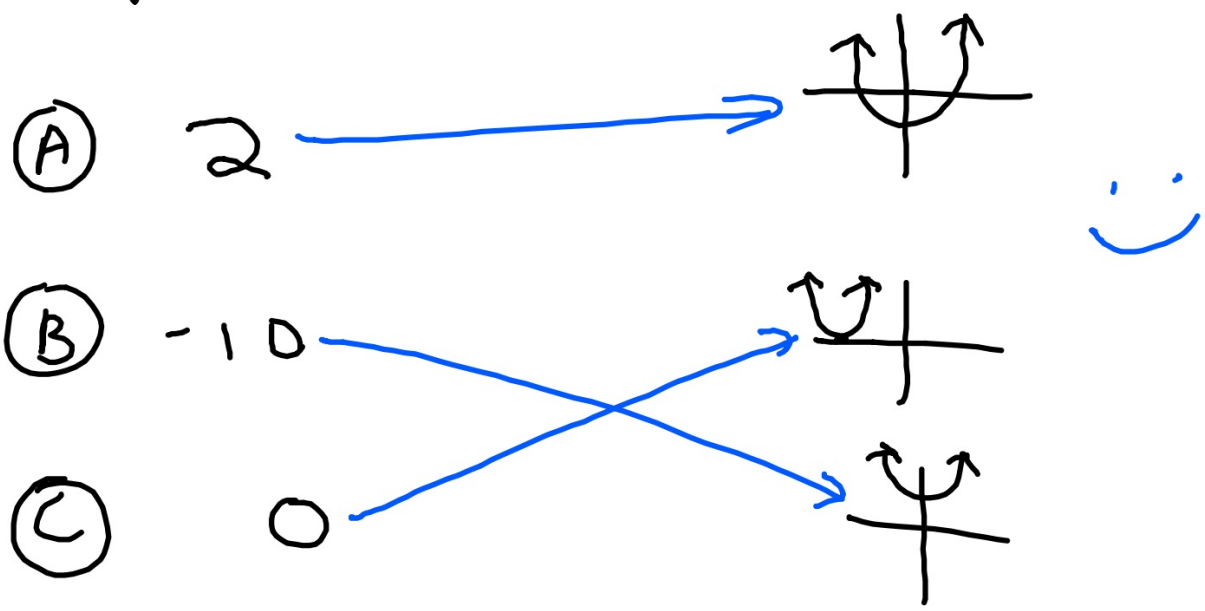
$x+7=0$ $\quad x+1=0$

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

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

⑥ Matching

Discriminant Value is



2-5-20 3rd Trig

① $f(x) = \frac{1}{4}x^4 - \frac{1}{6}x^6$

$f'(x) = x^3 - x^5$

② $f(x) = \frac{2}{x^2} + \frac{8}{x^4}$

Rewrite as $2x^{-2} + 8x^{-4}$

$f'(x) = -4x^{-3} - 32x^{-5}$

OR

$\frac{-4}{x^3} - \frac{32}{x^5}$

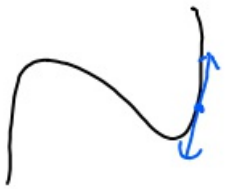
③ What is the slope of the line tangent to $f(x) = 3x^4 + 2x^2 - 1$ at $(1,4)$?

$f'(x) = 12x^3 + 4x$

$f'(1) = 12 \cdot 1^3 + 4 \cdot 1$

slope $= 16$

④ What is the equation of the line tangent to $f(x) = x^3 + 6x$ at $(1,7)$?



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

$f'(1) = 3 \cdot 1^2 + 6$

$= 9$

slope of 9 $\quad (1,7)$

$y - y_1 = m(x - x_1)$

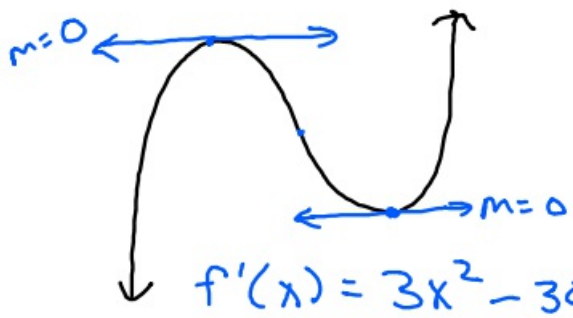
$y - 7 = 9(x - 1)$

$y - 7 = 9x - 9$

$+7 \quad +7$

$y = 9x - 2$

⑤ Find critical points of $f(x) = x^3 - 15x^2 + 72x$



$f'(x) = 3x^2 - 30x + 72$

$3x^2 - 30x + 72 = 0$

$\frac{3(x^2 - 10x + 24)}{3} = \frac{0}{3}$

$x^2 - 10x + 24 = 0$

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

$x - 6 = 0 \qquad x - 4 = 0$

$x = 6 \qquad x = 4$

Plug $x=6$ and $x=4$ into original eq.

$f(x) = x^3 - 15x^2 + 72x$

$f(6) = 6^3 - 15(6)^2 + 72 \cdot 6 = 108$ (6,108)

$f(4) = 4^3 - 15(4)^2 + 72(4) = 112$ (4,112)

Point of Inflection

$f'(x) = 3x^2 - 30x + 72$

$f''(x) = 6x - 30$

$6x - 30 = 0$

$x = 5$

Plug $x=5$ into original eq.

$f(5) = 5^3 - 15(5)^2 + 72(5) = 110$ (5,110)

(6) Find the x and y intercepts of $f(x) = x^2 + 7x + 6$.

x-intercept

$0 = x^2 + 7x + 6$

$0 = (x+6)(x+1)$

$x+6=0 \quad x+1=0$

$x=-6 \quad x=-1$

$(-6,0) \quad (-1,0)$

y-intercept

$y = 0^2 + 7 \cdot 0 + 6$

$y = 6$

$(0,6)$

(7) Match discriminant value with graph.

Disc. value $\sqrt{b^2-4ac}$

(A) 4

(B) -5

(C) 0