# 1-22-18 1st Trig

① Calculate the derivative of $f(x) = \frac{2}{x^3} + \frac{1}{x^4}$

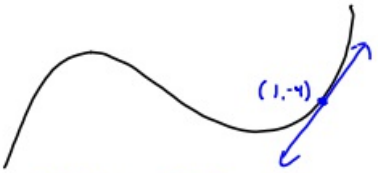
1st Rewrite

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

$f'(x) = -6x^{-4} + -4x^{-5}$

$= \frac{-6}{x^4} - \frac{4}{x^5}$

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




$f'(x) = 3x^2 - 12x$

$f'(1) = 3 \cdot 1^2 - 12 \cdot 1$

$= -9$

③ What is the <u>equation</u> of the line tangent to $f(x) = 4x^3 - 6x + 10$ at $(1, 8)$?


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

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

$= 6$

$m = 6 \quad (1, 8)$

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

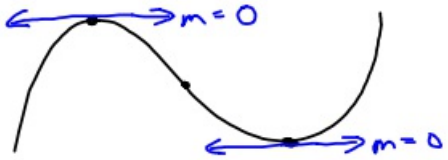
$y - 8 = 6(x - 1)$

$y - 8 = 6x - 6$

$+8 \quad +8$

$y = 6x + 2$

(4) Find the critical points on $f(x) = x^3 - 6x^2 + 1$.




$f'(x) = 3x^2 - 12x$

$3x^2 - 12x = 0$

$3x(x-4) = 0$

$3x = 0$ $\quad$ $x - 4 = 0$

$x = 0$ $\quad$ $x = 4$

What is y value when $x=0$ & $x=4$?

Plug $x=0$ and $x=4$ into the original equation

$f(x) = x^3 - 6x^2 + 1$

$x=0$ $\quad f(0) = 0^3 - 6 \cdot 0^2 + 1 = 1$

$(0, 1)$

$x=4$ $\quad f(4) = 4^3 - 6 \cdot 4^2 + 1 = -31$

$(4, -31)$

Point of Inflection

$f''(x) = 6x - 12$

$6x - 12 = 0$

$+12 \quad +12$

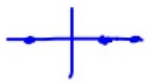
$6x = 12$

$x = 2$

$f(2) = 2^3 - 6(2)^2 + 1 = -15$

$(2, -15)$

⑤ Give the x & y intercepts of $f(x) = x^2 + 11x + 10$

x-intercept 

$y = 0$

$0 = x^2 + 11x + 10$

$(x+10)(x+1)$

$x+10=0$ $\quad$ $x+1=0$

$x=-10$ $\quad$ $x=-1$

$(-10, 0)$ $\quad$ $(-1, 0)$

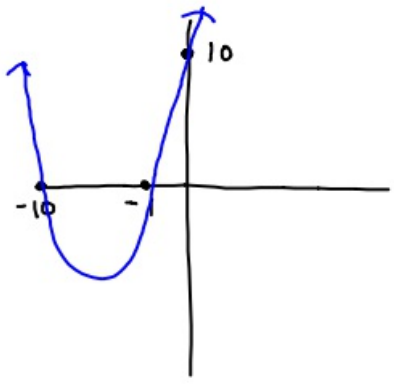
y-intercept

$x = 0$

$y = 0^2 + 11 \cdot 0 + 10$

$= 10$

$(0, 10)$




Discriminant

$b^2 - 4ac$

— → No Solutions 

+ → 2 solutions 

0 → 1 Solution 

1-22-18 3rd Trig

Review

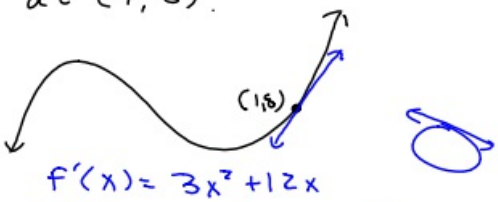
① $f(x) = \frac{2}{x^4} + \frac{1}{x^2}$

Rewrite as $f(x) = 2x^{-4} + 1x^{-2}$

$f'(x) = -8x^{-5} - 2x^{-3}$

$= \frac{-8}{x^5} - \frac{2}{x^3}$

② Give the slope of the line tangent to $f(x) = x^3 + 6x^2 + 1$ at $(1, 8)$.

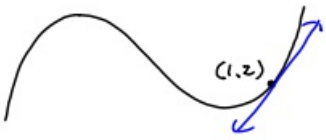



$f'(x) = 3x^2 + 12x$

$f'(1) = 3 \cdot 1^2 + 12 \cdot 1 = 15$

slope is 15

③ Give the <u>equation</u> of the line that is tangent to $f(x) = 4x^3 - 6x^2 + 4$ at $(1, 2)$.




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

$f'(1) = 12 \cdot 1^2 - 12 \cdot 1 = 0$

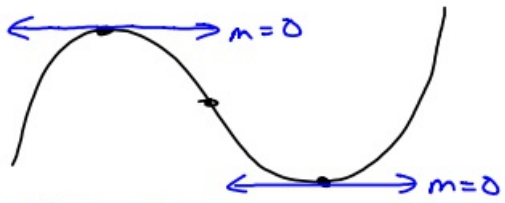
$m = 0 \quad (1, 2)$

$y - 2 = 0(x - 1)$

$y - 2 = 0$

$y = 2$

④ Give the critical points for $f(x) = x^3 - 3x^2 + 4$.




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

$3x^2 - 6x = 0$

$3x(x-2) = 0$

$3x = 0$ $\qquad$ $x - 2 = 0$

$x = 0$ $\qquad$ $x = 2$

Plug $x=0$ and $x=2$ into the original equation to find the y values (heights).

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

$f(0) = 0^3 - 3(0)^2 + 4 = 4$

$(0,4)$ ← relative maximum

$f(2) = 2^3 - 3(2)^2 + 4 = 0$

$(2,0)$ ← relative minimum

Point of Inflection

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

$6x - 6 = 0$

$+6 \quad +6$

$6x = 6$

$x = 1$

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

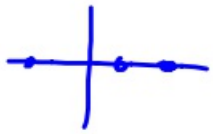
$2$

$(1,2)$

(5) Give the x and y intercepts for $f(x) = x^2 + 6x + 8$

**x-intercept**

$y = 0$



$0 = x^2 + 6x + 8$

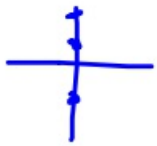
$0 = (x+2)(x+4)$

$x+2=0$ $\quad$ $x+4=0$

$x = -2$ $\quad$ $x = -4$

$(-2, 0)$ $\quad$ $(-4, 0)$

**y-intercept**

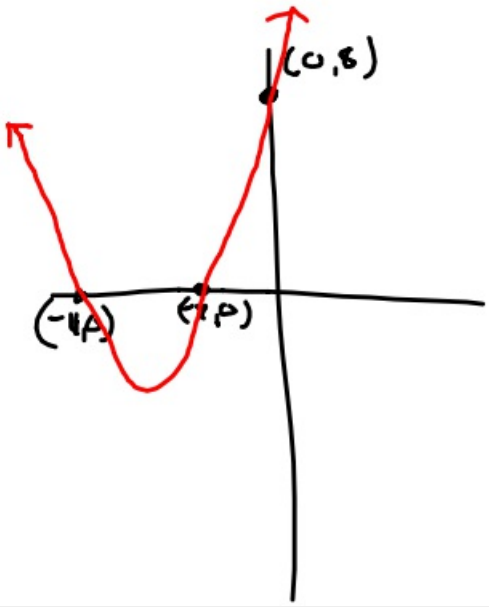


$x = 0$

$y = 0^2 + 6 \cdot 0 + 8$

$y = 8$

$(0, 8)$



1-22-18 4th Trig

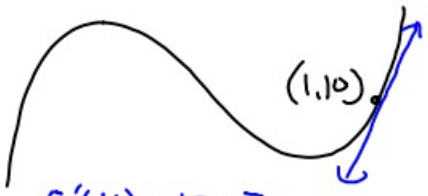
① $f(x) = \frac{2}{x^4} + \frac{3}{x^2}$

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

$f'(x) = -8x^{-5} - 6x^{-3}$

$= \frac{-8}{x^5} - \frac{6}{x^3}$

② Give the slope of the line tangent to $f(x) = 4x^3 + 6$ at $(1,10)$



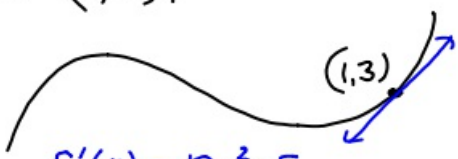

$f'(x) = 12x^2$

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

$= 12$

Slope is 12

③ Give the equation of the line tangent to $f(x) = 4x^3 - 5x + 4$ at $(1,3)$.




$f'(x) = 12x^2 - 5$

$f'(1) = 12 \cdot 1^2 - 5 = 7$

$m = 7 \quad (1,3)$

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

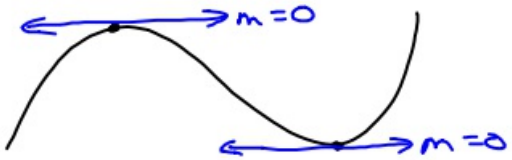
$y - 3 = 7(x - 1)$

$y - 3 = 7x - 7$

$+3 \qquad +3$

$y = 7x - 4$

(4) Find the critical points on $f(x) = x^3 + 9x^2 + 1$.




$f'(x) = 3x^2 + 18x$

$3x^2 + 18x = 0$

$3x(x+6) = 0$

$3x = 0$ $\qquad$ $x+6=0$

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

Plug $x=0$ and $x=-6$ into the original equation to find the height

$f(x) = x^3 + 9x^2 + 1$

$f(0) = 0^3 + 9 \cdot 0^2 + 1 = 1$

$(0,1)$ ← relative minimum

$f(-6) = (-6)^3 + 9(-6)^2 + 1 = 109$

$(-6,109)$ ← relative maximum

Point of Inflection

$f''(x) = 6x + 18$

$6x + 18 = 0$

$x = -3$

$f(-3) = (-3)^3 + 9(-3)^2 + 1$

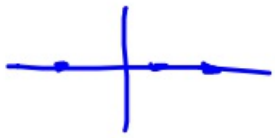
$= 55$

$(-3,55)$

⑤ Give the x and y intercepts for $f(x) = x^2 + 5x + 4$.

**x-intercepts**

$y = 0$



$0 = x^2 + 5x + 4$

$0 = (x+4)(x+1)$

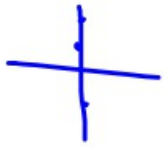
$x+4=0$ or $x+1=0$

$x = -4$ $x = -1$

$(-4, 0)$ $(-1, 0)$

**y-axis**

$x = 0$



$y = 0^2 + 5 \cdot 0 + 4$

$y = 4$ $(0, 4)$