Today's Plan:

Learning Target (standard): I will determine the equations for tangent and normal lines.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Continuity & MVT Worksheet

1) *continuous*

2) point discontinuity at x = 2

3) removable discontinuity at x = 2

infinite/essential discontinuity at x = 4

4) infinite/essential discontinuities at x = coterminal to $\frac{\pi}{2}$ & $\frac{3\pi}{2}$

5) $c = 2$

6) $c = 0$

7) $c = \frac{\sqrt{21}}{3}$

8) $2x + 3y = 5$

9) $6x + 5y = 32$ (tangent line)

$5x - 6y = -14$ (normal line)

Determine whether the function satisfies the hypothesis of the MVT and if so, find *c* that satisfies the conclusion.

$f(x) = x^{\frac{2}{3}} - x^{\frac{1}{3}}$ cont $[0,1]$ ✓

$[0,1]$

Rolle's Theorem

$f'(x) = \frac{2}{3}x^{-\frac{1}{3}} - \frac{1}{3}x^{-\frac{2}{3}}$

$f'(x) = \frac{2}{3x^{\frac{1}{3}}} - \frac{1}{3x^{2/3}}$ diff $(0,1)$ ✓

$f(1) - f(0) = (1-0)\left(\frac{2}{3}c^{-\frac{1}{3}} - \frac{1}{3}c^{-\frac{2}{3}}\right)$

$0 = \frac{2}{3}c^{-\frac{1}{3}} - \frac{1}{3}c^{-\frac{2}{3}}$

$0 = \frac{2}{3c^{\frac{1}{3}}} - \frac{1}{3c^{\frac{2}{3}}}$

$0 = \frac{1}{3}c^{-\frac{2}{3}}\left(2c^{\frac{1}{3}} - 1\right)$

$0 = \frac{2c^{\frac{1}{3}} - 1}{3c^{\frac{2}{3}}}$

$0 = \frac{2c^{\frac{1}{3}} - 1}{3c^{\frac{2}{3}}}$

$2c^{\frac{1}{3}} - 1 = 0$

$2c^{\frac{1}{3}} = 1$

$\left(c^{\frac{1}{3}}\right)^3 = \left(\frac{1}{2}\right)^3$

$c = \frac{1}{8}$

Find the equation of the tangent line to the curve through the given point.

$f(x) = \frac{2x+5}{x^2-3}$

$@x = 1$ $\left(1, -\frac{7}{2}\right)$

$f(1) = \frac{2(1)+5}{(1)^2-3}$

$f(1) = \frac{7}{-2}$

$f'(x) = \frac{2(x^2-3) - 2x(2x+5)}{(x^2-3)^2}$

$= \frac{2x^2 - 6 - 4x^2 - 10x}{(x^2-3)^2}$

$f'(x) = \frac{-2x^2 - 10x - 6}{(x^2-3)^2}$

$m_{tan}\left(1, -\frac{7}{2}\right) = \frac{-2(1)^2 - 10(1) - 6}{(1-3)^2}$

$= \frac{-2-10-6}{4}$

$m_{tan}\left(1, -\frac{7}{2}\right) = -\frac{9}{2}$

$y = mx + b$

$-\frac{7}{2} = -\frac{9}{2}(1) + b$

$-\frac{7}{2} + \frac{9}{2} = b$

$b = 1$

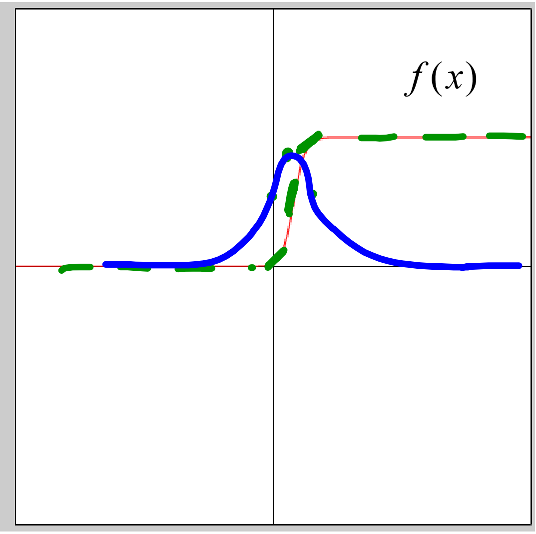
$\boxed{y = -\frac{9}{2}x + 1}$ tangent line

$2\left[y = -\frac{9}{2}x + 1\right]$

$2y = -9x + 2$

$\boxed{9x + 2y = 2}$

Sketch the graph of the derivative of the function.



Find the equation of the tangent line to the curve through the given point.

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

$(2,6)$

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

$f'(2) = -3 - 2(2)$

$= -3 - 4$

$f'(2) = -7$

$m_{tan(2,6)} = -7$

$y = mx + b$

$6 = -7(2) + b$

$6 = -14 + b$

$b = 20$

$\boxed{y = -7x + 20}$

$\boxed{7x + y = 20}$

Find the equation of the normal line to the curve through the given point.

$f(x) = x^5 - x^4$

$@x = 2$ $(2,16)$

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

$f'(2) = 5(2)^4 - 4(2)^3$

$= 80 - 32$

$f'(2) = 48$ $m_{tan(2,16)} = 48$

$m_{normal(2,16)} = -\frac{1}{48}$

$y = mx + b$

$16 = -\frac{1}{48}(2) + b$

$16 = -\frac{1}{24} + b$

$b = \frac{385}{24}$

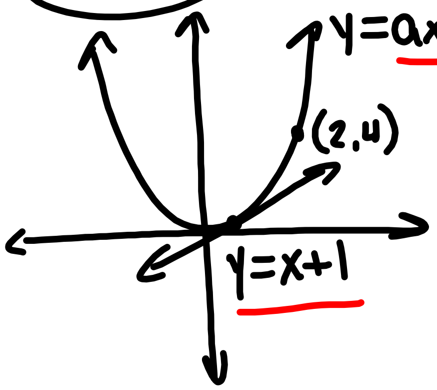
$\boxed{y = -\frac{1}{48}x + \frac{385}{24}}$ 48

$48y = -x + 770$

$\boxed{x + 48y = 770}$

The curve $y = ax^2 + bx + c$ passes through the point (2,4) and is tangent to the line $y = x + 1$ at (0,1). Find *a, b,* and *c.*

$y = ax^2 + bx + c = f(x)$



$f'(x) = 2ax + b$

$1 = 2a(0) + b$

$b = 1$

$m_{tan(0,1)} = 1$

$f'(x) = 1$

$f'(0) = 1$

x y'

$y = ax^2 + x + c$ @(2,4)

$4 = a(2)^2 + (2) + c$

$4 = 4a + 2 + c$