Recall:

1. Derivative of position is velocity $s'(t) = v(t)$
2. Derivative of velocity is acceleration $v'(t) = a(t)$
3. Derivative of acceleration is jerk $a'(t) = j(t)$
4. How to Find the Equation of Tangent Line to a Function at a point

The **Relative Maximum** of a function occurs at a point where:

1. The function is continuous
2. The derivative changes from positive to negative

The **Relative Minimum** of a function occurs at a point where:

1. The function is continuous
2. The derivative changes from negative to positive

$f(x) = 3x^3 - x^2 + x + 1$. Find the Equation of the tangent line at $x = 1$
Point P(1, 4)
$f'(x) = 9x^2 - 2x + 1 \quad f'(1) = 8$
$y - 4 = 8(x - 1)$ or $y = 8x - 4$

Find the value of the Linear Function at $x = 1.1$
Since $y(x) = 8x - 4$, $y(1.1) = 8(1.1) - 4 = 8.8 - 4 = 4.4$
This procedure is called:
Linearizing the function to find an approximate value of the original function close to 1.

Linearize the function $f(x) = \cos x$ at $x = \frac{\pi}{6}$ to find the approximate value of f(0.5). Use a calculator.

Point $P\left(\frac{\pi}{6}, \frac{\sqrt{3}}{2}\right)$

$f'(x) = -\sin x \quad f'\left(\frac{\pi}{6}\right) = -\frac{1}{2}$ = Slope

$y - \frac{\sqrt{3}}{2} = -\frac{1}{2}\left(x - \frac{\pi}{6}\right)$ or $y = -\frac{1}{2}x + \frac{\pi}{12} + \frac{\sqrt{3}}{2}$
$y(0.5) \approx 0.8778247916$

$f(x) = \frac{1}{3}x^3 + \frac{1}{2}x^2 - 6x$. Find the x-coordinate of the relative maxima.

$f'(x) = x^2 + x - 6 \equiv 0 \quad (x + 3)(x - 2) = 0 \quad x = -3 \quad x = 2$
Build a Sign Chart

	$-\infty$ to -3	-3 to 2	2 to ∞
x + 3	-	+	+
x – 2	-	-	+
f '(x)	+	-	+

Since the derivative changes from Positive to Negative at = 2, there is a relative maximum at $x = 2$.

Use your calculator to graph $f(x) = \frac{1}{3}x^3 + \frac{1}{2}x^2 - 6x$ to verify this fact.

Pre-Calc 2 Assignment 258 Thursday, June 4, 2015 Hour Name

1.	$f(x) = 5x^3 - 3x^2 + 2x - 1$ Write the equation of the tangent line at $x = 2$
2.	$f(x) = 4x^2 + \sin x$. Find $f'(x)$
3.	Position is given by $s(t) = 5t^3 - 6t^2 + 2t - 9$. Find the velocity at time $t = 2$.
4.	At time $t = 3$, Position, $s = 5$. Velocity is given by $v(t) = 2t - 6$. Find the position at $t = 2$.
5.	Position is again given by $s(t) = 5t^3 - 6t^2 + 2t - 9$. Find the acceleration at time $t = 3$.
6.	Draw the graph of a function such that $f(2) = 1$ and $\lim_{x\to 2} f(x) = \to \infty$
7.	Discuss the continuity of $f(x) = \begin{cases} x^2 - 3 & \text{if } x \le 2 \\ -2x + 5 & \text{if } x > 2 \end{cases}$
8.	$y = f(x)$. By Definition, what is $\frac{dy}{dx}$? Hint: $\frac{dy}{dx}$ is $f'(x)$

9.	$f(x) = 2x^2 + 3$. Find $f'(x)$ by the limit definition.
10.	$\lim_{x\to 2} \frac{x^2 + x - 6}{x^2 - 7x + 10}$
11.	$\lim_{x\to 0} \frac{\sqrt{6 + x} - \sqrt{6}}{x}$
12.	Draw the graph of a function such that $f(c) = 3$ and $\lim_{x\to c} f(x) = -1$
13.	Explain why $f(x) = 2x^2 + 1$ is continuous at $x = 3$.
14.	$y = 7x^2 - 3x$ Find y'
15.	$y = x + \sin x + 3 \cos x$ Find $y'(x)$

16. $r = 2 + 2 \sin ø$ Draw the Polar Graph	17. $r = 2 + 2 \sin 2ø$ Draw the Polar Graph	18. $r = 2 + \sin 2ø$ Draw the Polar Graph	19. $r = 2 \cos 2ø$ Draw the Polar Graph