Finding the Equation of the Tangent Line: *This part is available as a power point presentation*

Example 1: Find the equation of the tangent line of : $y = x^3 - x^2$ at $x = 2$

Solution:
The slope of the tangent line at any point is the derivative at
that point:
$$y' = 3x^2 - 2x$$

At $x = 2$, we need to find m, and the value of y
- at $x = 2$, $y' = 8$ or $m = 8$
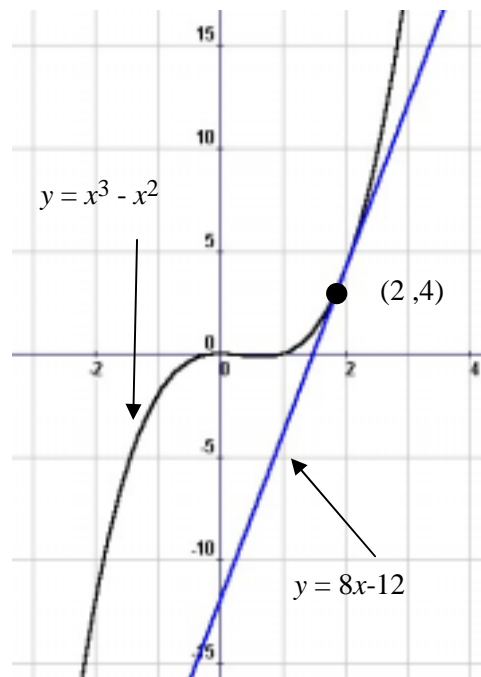- at $x = 2$, $y = 4$

Now, we want to find the equation of the line that passes the
point $(2, 4)$ with $m = 8$
$$y = mx + b$$
$$4 = 8(2) + b \text{ then } b = -12$$

The answer : $y = 8x - 12$

$y = x^3 - x^2$

$(2, 4)$

$y = 8x - 12$

Example 2: Find the equation of the tangent line of : $y = x^3 + x^2 - x + 2$ at $x = 1$

Solution:
The slope of the tangent line at any point is the derivative at that point:
$$y' = 3x^2 + 2x - 1$$
At $x = 1$, we need to find m, and the value of y
- at $x = 1$, $y' = 4$ or $m = 4$
- at $x = 1$, $y = 3$

Now, we want to find the equation of the line that passes the point $(1, 3)$ with $m = 4$
$$y = mx + b$$
$$3 = 4(1) + b \text{ then } b = -1$$
The answer : $y = 4x - 1$

Example 3: Find the points where the tangent line is horizontal for :
$$y = x^3 - 3x + 4 .$$
Solution:
If the tangent line is <u>horizontal</u>, then the slope $m = 0$ or $y' = 0$:
$$y' = 3x^2 - 3$$
$$= 3(x^2 - 1) = 3(x - 1)(x + 1)$$

Make $y' = 0$ and solve: $x = 1$ and $x = -1$
The points where the tangent line is horizontal are:
$(1, 2)$ and $(-1, 6)$

$(-1, 6)$

$(1, 2)$

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