Tangent Lines (Derivatives)

1) Find an equation of the tangent line to the curve at the given point.

\[ y = 2x^3 - x^2 + 2 \] ; \( (1,3) \)

- First, find the derivative: \( y' = 6x^2 - 2x \)
- Remember that derivative equals slope, \( m \).

- Secondly, plug in the x-value from the point given, \((1,3)\) into the derivative.

\[ y' = 6(1)^2 - 2(1) = 4 \]

therefore, \( m = 4 \)

- Thirdly, use point-slope formula to find the tangent line.

**Point-slope formula:** \( y - y_1 = m(x - x_1) \)

\[ (1,3) = (x_1, y_1) \]

\[ y - 3 = 4(x - 1) \]

\[ y - 3 = 4x - 4 \]

\[ y = 4x - 1 \] --this is the tangent line.

2) Find the equation of the normal line to the curve at the given point. \( (1,3) \)

-> Normal line means perpendicular line.

- The slope, ‘m’ of a perpendicular line is the negative reciprocal, for example, if an equation has slope, \( m = \frac{2}{3} \), it’s perpendicular line will have slope, \( m = -\frac{3}{2} \).

- Since the our given equation had slope, \( m = \frac{3}{1} \), it’s normal line will have slope, \( m = -\frac{1}{3} \).

Now, use point slope formula again using slope, \( m = -\frac{1}{3} \)

**Point-slope formula:** \( y - y_1 = m(x - x_1) \)

\[ (1,3) = (x_1, y_1) \]

\[ y - 3 = -\frac{1}{3}(x - 1) \]

\[ y - 3 = -\frac{1}{3}x + \frac{1}{3} \]

this is the normal line
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\[ y - 3 = -\frac{1}{3}(x - 1) \]

\[ y - 3 = -\frac{1}{3}x + 1/3 \]

The following works were referred to during the creation of this handout: *Stewart Calculus, 8th Ed.*