CALCULUS I

Sample Team Activity

Applying Differentiation Techniques

1. How do we find the equation of the tangent line to a curve at a point?
   - First, make sure the team recalls the point-slope formula for the equation of a line. We should be able to find the equation of a straight line using only the slope, and some arbitrary point on that line.
   - Given the curve $y = x^2$, what is the equation of the tangent line when $x = 3$?
   - Given the curve $f(x) = \sin(x) - \cos(x)$, find the equation of the tangent line at the point (0,-1).
2. How do we linearly approximate functions with a derivative?
   - Suppose we want to find the approximate value of $\sqrt[3]{8.03}$.
   - Can we find the exact value of $\sqrt[3]{8}$ without a calculator?
   - Find the equation of the tangent line to the curve $y = \sqrt[3]{x}$ at the when $x = 8$.
   - Find the value of the point on this tangent line when $x = 1.03$. Compare this to the result on your calculator for finding $\sqrt[3]{1.03}$.
3. How could we use this idea to find an approximate value for $\sqrt[5]{31.94}$?
4. Can we use the tangent line to help approximate a zero of a function?
   - Start with the equation $x^3 + 2x - 1 = 0$.
   - It's tough to find an exact solution to this. First, show that the function $f(x) = x^3+2x-1$ has at least one real zero on the interval $[0, 1]$.

- Find the equation of the tangent line to the function $f(x)$ when $x = 1$. We'll need some notation, so let $x_0 = 1$
- Where does that tangent line cross the x-axis? Label that point x_1.
- Now find the equation of the tangent line to the curve when $x = x_1$. Where does that line cross the x-axis? Label that point x_2.
- If you were to keep doing this, make a conjecture about what would happen with the sequence of points $x_0, x_1, x_2, \ldots$.