

- Find the derivative $y' = \frac{dy}{dx}$ for each of the following:
 - $y = e^2x + ex^2$
 - $y = \cot x$
 - $y = \sqrt{x} \sec(x^2)$
 - $y = 2 \tan^3(2x^3)$
 - $y = \frac{x^2 - 7 \cos(3x)}{x + \sin(3 - 2x)}$
 - $x^2y + 3xy - 5y^2 = 7$
 - $\cos^2(xy) = 1$
- Use the formal limit definition of the derivative to find the derivative of the following:
 - $f(x) = x^2 - 3x$
 - $f(x) = \frac{2}{x - 3}$
 - $f(x) = \sqrt{x - 2}$
- Use the quotient rule to derive the formula for the derivative of $\tan(x)$.
- If $f(x) = \sqrt{3x - 5}$, find the intervals where $f(x)$ is continuous, and find the intervals where $f(x)$ is differentiable.
- If $f(x) = 3x^4 - 5x^2 + 7x - 12$, use differentials to approximate $f(1.1)$
- Use differentials to estimate $\sqrt[3]{9}$. How good is your estimate?
- Suppose helium is being pumped into a spherical balloon at a rate of 4 cubic feet per minute. Find the rate at which the radius is changing when the radius is 2 feet.
- Find the equation of the tangent line to the graph of $f(x) = \tan(4x)$ when $x = \frac{3\pi}{16}$
- Find the points on the graph of $y = 2x^3 + 3x^2 - 72x + 5$ at which the tangent line is horizontal.
- Find the equation of the tangent line to the graph of the relation $x^3 + x^2y = \sqrt{y^3} - 3$ at the point $(1, 4)$.
- Draw the graph of a function $f(x)$ that is continuous when $x = 3$, but is not differentiable when $x = 3$.
- Find $g'(2)$ if $h(x) = f(g(x))$, $f(3) = -2$, $g(2) = 3$, $f'(3) = 5$, and $h'(2) = -30$.
- Find $f^{(8)}(x)$ if $f(x) = \sin(2x)$
- Find $f^{(13)}(x)$ if $f(x) = x^{12} + 7x^5 - 3x^3 - 1$