

Sample Exam #2
MAT 1475 Fall 2019

1. Find the equation of the tangent line to the curve $f(x) = \frac{1-x}{1+x}$ at $x = 2$. Use the slope-intercept form.
2. Find the derivative of $f(x) = x^2 - 3x + 5$ using the **definition of the derivative**.
3. A spherical balloon is being inflated. Find the rate of change of the volume V of the balloon with respect to its radius r . Hint: Recall that for a sphere $V = \frac{4}{3}\pi r^3$.
4. Differentiate the given functions
 - (a) $f(t) = 3t^4 - \frac{5}{2}t^5 + 6t$
 - (b) $h(x) = \frac{\sin(x)}{1 + \cos(x)}$
 - (c) $f(x) = \sec(x) - \sqrt{2}\tan(x)$
 - (d) $g(s) = (s^5 + 2s)^2$
 - (e) $y = -3x^{-8} + 2\sqrt{x}$
 - (f) Find $h''(t)$ if $h(t) = \frac{3t - 2}{5t}$
5. Find the **points** on the curve where the tangent is horizontal to $y = \frac{1}{3}x^3 - 4x + 15$.
6. Find the equation of the tangent to the curve $y^2e^{x^2-16} - xy^{-1} = 2$ at $(4, 2)$.
7. Use logarithmic differentiation for find $\frac{dy}{dx}$ when $y = \frac{x(x+1)^3}{(3x-1)^2}$.
8. Use logarithmic differentiation for find $\frac{dy}{dx}$ when $y = x^{\cos x}$.
9. Differentiate

(a) $y = \frac{1}{(x^2 + 1)^4}$

(b) $y = \ln\left(\frac{1}{x^2}\right)$

(c) $y = 3^x \sec x$

(d) $y = 16^{\sin(x)}$

(e) $y = \ln(\cot(x))$

(f) $y = \sin(6x) \cos(2x)$

(g) $y = \frac{3x^2 - 5}{2 - x^3}$

(h) $y = \sin^{-1}(3x)$