

Worksheet 4: More Derivatives (3.3-3.6)

Name: _____

Due: June 15th by 3PM via HuskyCT

Compute the derivative of the functions below using **any** of the differentiation rules up through Section 3.6.

1. $f(x) = \frac{\sin(x)}{1 + \sin(x)}$

2. $f(x) = \sin(x) \cos(x)$

3. $f(x) = x^n \cos(x)$, n a constant.

4. $f(x) = \frac{\tan(x)}{x^2 + 1}$

5. $y = (x^3 - x + 1)^{10}$

6. $y = \sqrt{x^3 + 4x}$

7. $y = 3^{x^4} \cos(x)$

8. $f(x) = \ln(\sqrt{x})$

9. $f(x) = x^{3x^2}$

Use **implicit differentiation** to differentiate y with respect to x . Your formula for y' may involve both x and y .

10. $x^2y - axy^3 = x + y$, where a is a constant

11. $e^{xy} = x^2 + y^2$

12. $\sin(x + y) = x + \cos(3y)$

13. **Extra Credit:** Show that for any $x > 0$

$$\lim_{n \rightarrow \infty} \left(1 + \frac{x}{n}\right)^n = e^x.$$

Hint: Manipulate the fraction and the exponent algebraically and use the fact you learned from class (Section 3.6) that $\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n = e$.