

Due date: \_\_\_\_\_

Name: \_\_\_\_\_

1. Differentiate the following functions.

a)  $f(x) = (5x^3 - x^4)^7$

b)  $y = \sin^6 x$

c)  $f(x) = \frac{1}{(1-2x)^3}$  (Use the Chain Rule for practice, though you can check your work with the Quotient Rule.)

d)  $f(x) = \frac{5}{\sqrt{3x+4}}$  (Use the Chain Rule for practice, though you can check your work with the Quotient Rule.)

e)  $f(x) = e^{\sqrt{3x+1}}$

f)  $f(x) = e^{\cosh(x^2-4)}$

g)  $y = x^2 e^{3x}$

h)  $y = (x^2 + x)e^{\sin x}$

i)  $f(x) = \sin^{-1}(\sqrt{x} \cos x)$

$$j) f(x) = \csc\left(\frac{\log_2 x}{x}\right)$$

$$k) y = e^{\cosh^{-1} 5x}$$

$$l) y = x^2 e^{\cos^2 3x}$$

$$m) f(x) = \sin(\cos(\tan x))$$

n)  $f(x) = \log_2(\csc(e^x))$

o)  $y = \sqrt{\sec(x^3)}$

p)  $f(x) = \sqrt{\ln(\sec x)}$

q)  $f(x) = \sqrt[3]{\cos^{-1}(2x + 1)}$

$$r) f(x) = \sin^{-1}(\sqrt{\tanh x})$$

$$s) f(x) = \frac{\cosh \sqrt{x}}{\log_3 x}$$

$$t) f(x) = \frac{\sinh \sqrt{x}}{\ln x}$$

u)  $y = \sinh^{-1}(\tan 3x)$

v)  $y = 3^{\sin \sqrt{x}}$

2. Find an equation for the tangent line of  $f(x) = \sin(5x)$  at  $x = \frac{\pi}{10}$ .

3. Find an equation for the tangent line of  $y = \sqrt[3]{4x - 9}$  at  $x = 2$ .

4. Find an equation for the tangent line of  $y = \sqrt{9 - x^2}$  at  $x = 1$ .

5. Find an equation for the tangent line of  $f(x) = \ln(e^{2x} + 1)$  at  $x = 0$ .

6. Find the second derivative of  $y = \cos(2x)$ .

7. Find the second derivative of  $y = \sqrt{x^2 + 1}$ .

8. Find all points where  $f(x) = e^{-x^2}$  has a horizontal tangent line.

9. Find all points where  $f(x) = 2 \cos x + \cos^2 x$  has a horizontal tangent line.



10. Differentiate  $f(x) = (2x + 1)^3(4x - 3)^4$  and simplify your answer by factoring.

11. Differentiate  $f(x) = (x + 5)^6(3x - 2)^5$  and simplify your answer by factoring.

**Review**

12. Find the following limits.

a)  $\lim_{x \rightarrow \pi/2^+} 2^{\tan x}$

b)  $\lim_{x \rightarrow 0^-} (\cot x + \ln|x|)$

**Challenge:** Find the 1000<sup>th</sup> derivative of  $y = \cos(2x)$ .

Q: If you wrote all of the numbers from 300 to 400 on a piece of paper, how many times would you have written the number 3?

Optional exercises from the Stewart textbook if you'd like more practice:

3.4 (p.204) #7-41 odd, 45-53 odd, 59

3.6 (p.223) #3-25 odd, 31, 33

3.11 (p.264) #31-45 odd