

Math 2310 - Practice Test 2

- Derivatives, derivatives, derivatives.
- There will be many straight “compute this derivative” type problems. Study the many assigned problems: in-class and homework. There will be question(s) about finding the equation of a tangent line.
- There will be a graph of a function and you will be asked to graph its derivative (and make the second derivative).
- There will be a related rates problem. Study these 3.10: 7,9,15,17,20,21,32,36,42.
- Here are some representative problems - it would be good to redo the quizzes as well.

1 Sample Derivatives

1. $\frac{d}{dx}[\tan(x) \cos(x)]$
2. $\frac{d}{dx}\left[\frac{\tan(x)}{\cos(x)}\right]$
3. $\frac{d}{dx}[\tan(x) + \tan^{-1}(x)]$
4. $\frac{d}{dx}[x^2 + 2 \sec(x^3)]$
5. $\frac{d}{dx}[\tan(\sec(x^3))]$

2 Implicit Differentiation

Find the Derivative.

1. $y = xy^2 - e^{x^2} + \ln(x^3 + y)$
2. $y = \tan^{-1}(x)$
3. $y = \cos^2(xy)$
4. $x^2y = e^{xy}$
5. $y + y^3x^2 = 7$ Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.
6. Find the line tangent to the function $x^2 + y^2 = 4$ where $x = 1$. Note there are two possible answers to this question.

3 Logarithmic Differentiation

1. $y = x^{x^3+1}$
2. $y = [\tan(x)]^{3x}$
3. $y = 2^x$
4. $y = x^{\ln(x)}$
5. Find the line tangent to the function $f(x) = x^{\ln(x)}$ where $x = e$.

Our list of derivatives that we have memorized:

$\frac{d}{dx}[k] = 0$	$\frac{d}{dx}[x^n] = nx^{n-1}$
$\frac{d}{dx}[e^x] = e^x$	$\frac{d}{dx}[\ln(x)] = \frac{1}{x}$
$\frac{d}{dx}[\sin(x)] = \cos(x)$	$\frac{d}{dx}[\sin^{-1}(x)] = \frac{1}{\sqrt{1-x^2}}$
$\frac{d}{dx}[\cos(x)] = -\sin(x)$	$\frac{d}{dx}[\cos^{-1}(x)] = \frac{-1}{\sqrt{1-x^2}}$
$\frac{d}{dx}[\tan(x)] = \sec^2(x)$	$\frac{d}{dx}[\tan^{-1}(x)] = \frac{1}{1+x^2}$
$\frac{d}{dx}[\cot(x)] = -\csc^2(x)$	$\frac{d}{dx}[\cot^{-1}(x)] = \frac{-1}{1+x^2}$
$\frac{d}{dx}[\sec(x)] = \sec(x)\tan(x)$	$\frac{d}{dx}[\sec^{-1}(x)] = \frac{1}{ x \sqrt{x^2-1}}$
$\frac{d}{dx}[\csc(x)] = -\csc(x)\cot(x)$	$\frac{d}{dx}[\csc^{-1}(x)] = \frac{-1}{ x \sqrt{x^2-1}}$