

## EXAM 2 IS TUESDAY IN QUIZ SECTION

Allowed:

1. A **Ti-30x IIS Calculator**
2. An 8.5 by 11 inch sheet of handwritten notes (front/back)
3. A pencil or black/blue pen (and a ruler)

Details and rules:

1. 4 pages of questions, 50 minutes.
2. **Show your work using methods from class.** The correct answer with no supporting work is worth zero points.
3. Clearly indicate work you want graded.

4. No make-up exams; if you are physically unable to be at the test, go to doctor and get documentation (the other exams will be weighted more heavily)
5. There are multiple versions of the test!!!! They will look similar. If you copy off of a classmate we will know and you'll get a zero on the *entire test* (even if you just copied on one problem). So don't sit next to your study partners and don't be tempted to copy off a classmate.

## Quick Review (Checklist)

### *11.1/11.2: New Derivative Skills*

We added

$$\frac{d}{dx} (e^{f(x)}) = e^{f(x)} f'(x)$$

$$\frac{d}{dx} (\ln(x)) = \frac{1}{f(x)} f'(x)$$

Be able to use these in combination with our other rules. Two examples from homework:

1.  $y = (e^{4x} + 5)^{10}$

2.  $y = x^3 \ln(1 + \sqrt{x})$

## **12.1/12.3, 13.2: Anti-derivative Skills**

$$\int k \, dx = kx + C$$

$$\int x^n \, dx = \frac{1}{n+1} x^{n+1} + C$$

$$\int \frac{1}{x} \, dx = \ln(x) + C$$

$$\int e^{ax} \, dx = \frac{1}{a} e^{ax} + C$$

*Step 1:* Expand and Simplify

*Step 2:* Use the rules above

(don't forget "+C")

*Step 3:* Check your answer (derivative)

*Step 4:* If it is a definite integral,  
evaluate and subtract.

Three examples:

1.  $\int \frac{5}{x} - 3e^{4x} \, dx$

2.  $\int \frac{x+2}{x^6} \, dx$

3.  $\int_0^4 5 + \sqrt{x} \, dx$

## **10.1-10.3, 12.4: Analyzing Functions**

**First:** What are you given?

What do you want?

What is the 'original' function?

**Second:** Translate

**Problem Type 1:** To find *critical numbers, horizontal tangents, local max/min, or increasing/decreasing*

1. Solve  $f'(x) = 0$

2. Draw 1<sup>st</sup> derivative number line.

**Problem Type 2:** To find *points of inflection, concave up/down.*

1. Solve  $f''(x) = 0$

2. Draw 2<sup>nd</sup> Derivative number line.

**Problem Type 3:** To find *global max/min* on a given interval

1. Solve  $f'(x) = 0$

2. Plug critical numbers and endpoints into the original function.

**Third:** Interpret.

Reread the question. Did you answer it? Did you give the answer in the desired form? Units?

### ***10.3, 12.4, 13.3: Special Applications***

- Know when and how to do derivatives and antiderivatives:
  1. TR/MR, TC/VC/MC, P/MP,
  2. amount in a vat / rate of flow
  3. height / rate of ascent,
  4. dist / speed

Know how to do all the homework from 13.3 (areas between curves)!

### ***Essential algebra skills***

1. Rewriting powers, expanding, simplifying
2. Solving equations
  - clear the denominator
  - powers/roots, exponentials/logs
  - factoring
  - quadratic formula

## *Two Random Old Midterm Questions*

1. Find *all* critical values for the function

$$f(x) = 5x + \frac{3}{x} + 3$$

and use the second derivative test to classify the critical values as local maxima or local minima. Clearly label your answers.

2. Suppose  $A'(t) = t^2 - 8t + 12$  is the rate of change in the amount of water in a vat, where  $t$  is in hours and  $A'(t)$  is in gallons per hour. Assume the vat contains 100 gallons of water at time  $t=0$ .

(a) Find the formula,  $A(t)$ , for amount of water in the vat at time  $t$ .

(b) Find the maximum amount of water in the vat between  $t = 0$  and  $t = 7$  hours