List the names of the others in your group, where they are from or which HS they attended, and their major:

1. Evaluate the following limits:

(a).
$$\lim_{x \to 2} \frac{x^2 - 4}{x^2 + x - 6}$$
 (b). $\lim_{x \to \infty} \frac{x^2 - 4}{3x^2 + x - 6}$ (c). $\lim_{x \to 2} \frac{x^2 + 4}{x - 6}$

2. Explain in your own words what the derivative of a function represents.

3. Find the derivatives of the following functions and state any differentiation rules used. [Do not simplify.]

(a).
$$f(x) = \frac{4-x}{3+x}$$
 (b). $f(x) = x \cos ax$

(b). $xy^2 = 3x + y$ [Find dy/dx using implicit differentiation.]

x

4. Evaluate the following integrals. [Note: You may or may not need to simplify and/or use substitution.] Remember that you can check your answer by differentiating the result.

(a).
$$\int_0^1 x^3 - 3x^2 + 1 \, dx$$
 (b). $\int \sin(3\theta) \, d\theta$

(c).
$$\int \frac{x^4 + 2x^2}{x^2} dx$$
 (d). $\int (2x+1)(x^2+x)^8 dx$

5. Determine whether the following statements are true or false. Explain why or state the rule.

(a).
$$\int x \cdot \cos x \, dx = \frac{1}{2}x^2 \cdot \sin x + C$$
 (b). $\int 3f(x) \, dx = 3 \int f(x) \, dx$ (c). $\int xf(x) \, dx = x \int f(x) \, dx$

6. Evaluate the following integral:

$$\int x^n dx$$

For which specific value of n can we <u>**not**</u> use the above rule? Try using it in this case and see what happens. Explain anything you notice that inc

Try using it in this case and see what happens. Explain anything you notice that indicates why the rule doesn't work in this case.

7. Given $f(x) = \int_{1}^{x} 3t^{2} dt$, find f'(x) in 2 ways:

(a). By evaluating the integral to obtain f(x) and then differentiating to obtain f'(x)

(b). By using Pt. 1 of the Fundamental Theorem of Calculus (p. 322) [Hint: Look at alternate form 5 on p. 323].

8. Sketch the graph of a function f that satisfies the following conditions.

f(-3) = -1, f(2) = 0, f has a jump discontinuity at $x = -3, \lim_{x \to \infty} f(x) = -4$ f'(x) = -1 on $(-\infty, -3), f'(x) > 0$ on (-3, 2), f'(x) < 0 on $(2, \infty)$

9. Below are the graphs given for the exponential function $f(x) = e^x$ and the natural logarithmic function $f(x) = \ln x$. Use the graphical techniques of Section 2.2 [See Example 1 and Exercises 3-11] to <u>sketch</u> a graph of the derivative for each of the functions. [Do <u>NOT</u> look up the derivatives of these functions. We haven't learned them yet. Just use graphical techniques to sketch the derivatives.]



10. Recall that if an inverse function exists, its graph can be found by reflecting the original function through the line y = x. Sketch the inverse function on the graph below.

Do you think that the derivative exists for the inverse function? Why or why not?



Note: We will be discussing exponential, logarithmic, and inverse functions in more detail. Recall from your precalculus course that e represents an irrational number, i.e. $e \approx 2.71828...$

Additional Homework:

1. Think back to Calculus I – I know this may be hard:) Which concepts do you feel particularly comfortable with and which ones do you feel are still a particular challenge to you?

2. <u>Read Section 6.1</u> paying particular attention to the items enclosed in red boxes.

(a). Summarize the section in a few sentences.

(b). List any of the concepts that are unclear. [Don't worry. We'll be discussing this section in more detail later.]

(c). Answer exercises # 3-8, 15, 16, 31 on page 406. [Keep these problems in your homework notebook.]