

# Math 1A Sections 308-309

## Worksheet 4: September 21, 2009

Evaluate the following limits. Be sure to make sure everyone in your group understands how to solve each problem. Focus on writing up your solutions as if this were the midterm exam. Before starting each problem, try to “guess” what the answer should be.

### Limits

1.  $\lim_{x \rightarrow -3^-} \frac{x^3 - 7x}{(x+3)(x+2)}$ . Does the 2-sided limit exist?
2.  $\lim_{x \rightarrow \infty} \frac{t^2 - 9}{2t^2 + 7t + 3}$
3.  $\lim_{x \rightarrow -\infty} \frac{x^5 + 46x^4 + 9x^2 + 7}{7x^5 + 26x^3 + 8x}$
4.  $\lim_{x \rightarrow \infty} (x + \sqrt{x})$
5.  $\lim_{x \rightarrow -\infty} (x + \sqrt{x^2 + x + 1})$

### Derivatives

1. State the definition of the derivative of a function  $f(x)$ .
2. Using this definition, compute the derivative of  $f(x) = x^3$ . (Actual midterm question!)
3. The following limit represents the limit of a function. Which function?

$$\lim_{h \rightarrow 0} \frac{\sin(3x + 3h) - \sin(3x)}{h}$$

4. Can you write the following limit as the derivative of some function at a point  $a$ ? (E.g.  $f'(a)$ )

$$\lim_{h \rightarrow -2} \frac{e^{3x} - e^{-6}}{x + 2}$$

5. Find the equation of the line tangent to the curve  $y = e^x + 3x^2 - 6$  at the point  $x = 0$ .
6. Sketch the graph of a function for which  $f(0) = 0$ ,  $f'(0) = -1$ ,  $f(1) = 0$ ,  $f'(1) = -1$ . (Actual midterm question!)