

NAME: \_\_\_\_\_

Student ID #: \_\_\_\_\_

QUIZ SECTION: \_\_\_\_\_

## Math 124 A & B

### Midterm I

February 3, 2009

Problem 1	10	
Problem 2	12	
Problem 3	8	
Problem 4	5	
Problem 5	8	
Problem 6	7	
<b>Total:</b>	<b>50</b>	

- Your exam should contain 6 problems on 4 pages. Check that you have a complete exam!
- Unless otherwise instructed, **show all your work**. Answers with no supporting work, or obtained by guess-and-check, will result in little or no credit, even if correct.
- Indicate your **final answer** by placing a box around it.
- Unless otherwise indicated, **leave your answers in exact form** instead of a decimal approximation. That is,  $\sqrt{2}$  instead of 1.4142, and  $\frac{\pi}{2}$  instead of 1.57. Simplify all you can.
- If you need more room, use the backs of pages, but indicate to the grader that you have done so.
- Raise your hand if you have any questions.

GOOD LUCK!

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Do you want your grades so far posted on our class website, in about 1 week, by last 4 digits of your student ID?

Yes, please post my grade. Sign to give permission: \_\_\_\_\_

No, please don't post my grades.

1 (10 pts = 2+3+3+2) Compute the limits. Your final answer should be a number,  $+\infty$ ,  $-\infty$ , or “does not exist”.

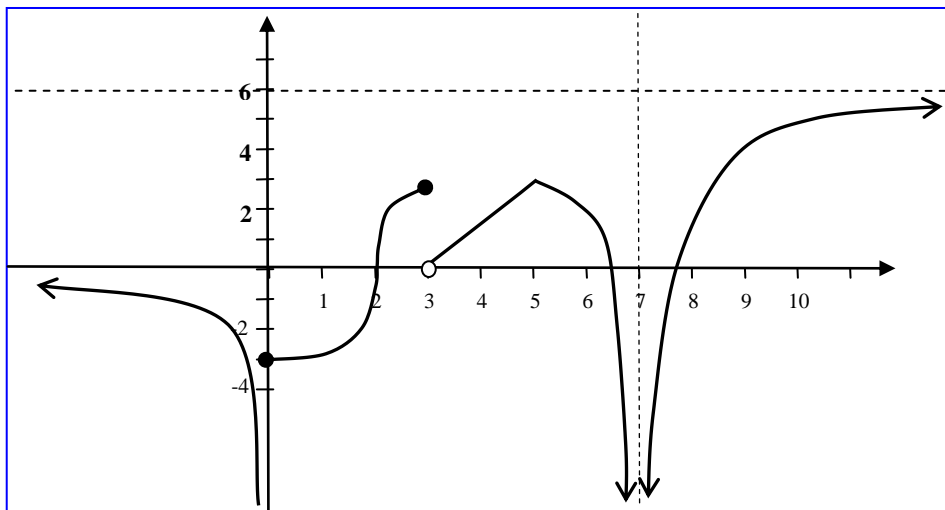
a)  $\lim_{x \rightarrow 2^-} \frac{e^x}{2-x}$

b)  $\lim_{x \rightarrow \infty} (x - \sqrt{x^2 + 3})$

c)  $\lim_{t \rightarrow 3} \frac{\frac{1}{3} - \frac{3}{t^2}}{t-3}$

d)  $\lim_{\theta \rightarrow 0} \frac{\sin(13\theta)}{5\theta}$

2 (12 pts=3+3+2+4) Below is the graph of a function,  $y = f(x)$ . Use it to answer the following questions, no justification needed:



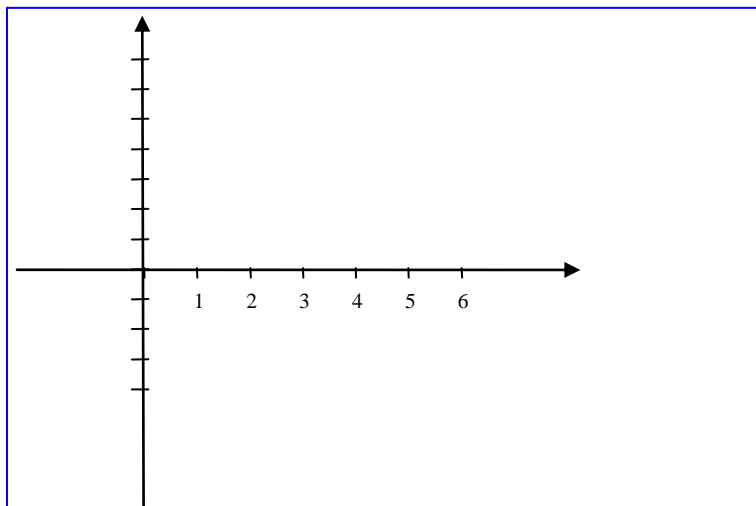
a) State all the values  $a$  for which  $f(x)$  is not continuous at  $x=a$ .

b) State all the values  $a$  for which  $f(x)$  is not differentiable at  $x=a$ .

c) Evaluate the two limits at infinity:

$$\lim_{x \rightarrow +\infty} f(x) = \quad \text{and} \quad \lim_{x \rightarrow -\infty} f(x) =$$

d) Sketch the portion of the graph of the derivative function  $f'(x)$  corresponding to the interval  $0 \leq x \leq 6$ .



3 (8 points) Let  $g(x) = \frac{x^2 - 2x - 8}{x + 2}$ . Compute all the appropriate limits to determine each of the following:

a) Determine if this function has any horizontal asymptotes. If it does, list the equation(s). If none, say so.

b) Determine if this function has any vertical asymptotes. If it does, list the equation(s). If none, say so.

4 (5 pts) Let  $f(x) = \begin{cases} \cos x + 1, & x \leq 0 \\ 2 - 3x, & x > 0 \end{cases}$ . Determine if this function is continuous at  $x = 0$ . Show all work.

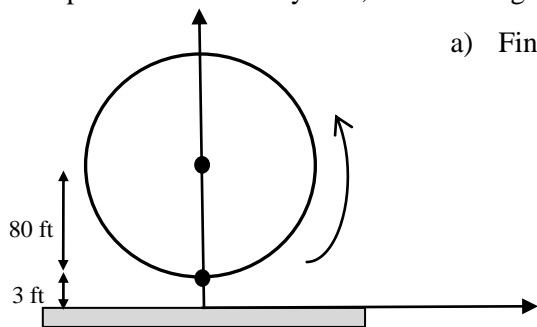
5 (8 points) Let  $f(t) = e^t \cos t + 1$ .

a) Compute its derivative:  $f'(t) =$

b) Compute the equation of the tangent line to the graph of  $y = f(t)$  at the point  $(0, 2)$ .

6 (7 points) Ryan is riding a ferris wheel of radius 80 feet, as pictured below. He starts at the lowest position on the wheel, which is 3 feet above ground. The wheel rotates counterclockwise, at an angular velocity of  $\frac{2\pi}{5}$  radians/minute.

Impose a coordinate system, with the origin at the point directly below the wheel, at ground level.



a) Find the parametric equations for Ryan's position,  $(x(t), y(t))$ , after  $t$  minutes.

b) Find the first time when Ryan's horizontal velocity is zero.