MAT 241 Section 07 Fall 2009
Exam I Review Sheet
Exam Date 10/14/09
Review Session TBA

The first exam covers all material in Chapter 2. In addition, it may be useful to review the material from Chapter 1.

A. Secant Lines

For problems 1-3, a function and a point on its graph are given. Sketch the graph, and draw a secant line passing through the given point and another point on the graph of your choosing. What is the slope of the secant line?

1. $f(x) = x^2 + x \quad (1, 2)$
2. $g(x) = \sin(x) \quad (\pi, 0)$
3. $h(t) = \ln(t) - 2 \quad (1, -2)$

B. Limits

For problems 4-6, sketch a function that satisfies each of the given equalities.

4. $\lim_{x\to 0} f(x) = 1 \quad f(0)$ is undefined
5. $\lim_{x\to 1^+} g(x) = -1 \quad \lim_{x\to 1^-} g(x) = 1 \quad g(1) = 1$
6. $\lim_{x\to 2^+} h(x) = \infty \quad \lim_{x\to 2^-} h(x) = -\infty \quad h(2) = 0$

In problems 7-9, use limit laws to evaluate each limit.

7. $\lim_{x\to -1} 2x(x+1)$
8. $\lim\limits_{x\to 2} \dfrac{x^2+1}{x^2-1}$
9. $\lim_{t\to 3} \sqrt{t^3 - 9}$

In problems 10-12, find the one-sided limits of the function at the given point. Use this to sketch the graph of the function over the given interval.

10. $f(t) = -\dfrac{1}{t^2} \quad t = 0 \quad [-1, 1]$
11. $g(x) = \dfrac{1}{x^2 - 1} \quad x = 1 \quad [0, 2]$
12. $h(x) = \ln(x + 2) \quad x = -2 \quad [-4, 0]$

In problems 13-15, a function is given. Evaluate the limit of each function at ∞ and $-\infty$. What geometric features of the graph of the function are described by these limits?

13. $f(x) = \dfrac{x+1}{x-1}$
14. $g(t) = 2\arctan(t)$
15. $h(x) = e^{-x}$

C. Continuity

16. What sorts of discontinuities are exhibited by the functions in problems 4-6?

In problems 17-19, determine where the given function is continuous..

17. $f(t) = \dfrac{\sqrt{t-1}}{t-2}$
18. $g(x) = \sqrt{x^2+1}$
19. $h(t) = \ln(\sin(t))$

In problems 20-22, use continuity to evaluate the given limit.

20. $\lim_{x\to 1}(x^2+x)\ln(x)$
21. $\lim_{x\to -\pi} \frac{\sin(x)+\tan(x)}{\cos(x)}$
22. $\lim_{x\to 1} \ln(\sin(2\arctan(x)))$

In problems 23 and 24, use the Intermediate Value Theorem to show that, given $f(x)$, $[a,b]$, and N, there is $a < c < b$ with $f(c) = N$.

23. $f(x) = \sin(x) \quad [a,b] = [0,\pi/2] \quad N = 1/7$
24. $f(x) = x^3 - 2 \quad [a,b] = [1,2] \quad N = 0$

D. Derivatives

In problems 25-27, draw a graph of the function on the given interval, and then sketch its derivative.

25. $f(x) = \sin(x) \quad [-\pi,\pi]$
26. $g(t) = \tan(t) \quad (-\pi/2, \pi 2)$
27. $h(x) = \frac{1}{1+x^2} \quad [-1,1]$

In problems 28-30, evaluate the derivative of the given function at the given point.

28. $f(x) = x^3 \quad x = 2$
29. $g(x) = \sqrt{x+1} \quad x = 0$
30. $h(x) = \dfrac{1}{x^2} \quad x = -1$

In problems 31-33, evaluate the derivative of the given function.

31. $f(x) = \dfrac{x^2}{2}$
32. $g(x) = \sqrt{2x}$
33. $h(t) = \dfrac{1}{t+1}$