Math 122 (Section 1) **Test 2 Topics Sheet**

Chapter 2

2.1 Given some function $P = f(t)$, you should be able to do the following:

1. Compute total change in P between $t = a$ and $t = b$.
2. Compute the average rate of change of P between $t = a$ and $t = b$.
3. Compute the (instantaneous) rate of change of P at some point $t = a$.
4. From a graph, determine where the slope is positive, negative, or zero. Also determine where you have the greatest and least slopes.

Be sure to include correct units for (1)–(3) above. Look at #1, 3, 5, 6, 7, 9, 10, 11, 12, 13 from section 2.1.

2.2 Given a function $y = f(x)$, $f'(a)$ denotes the derivative of $f(x)$ at the point $x = a$. All three of the following mean the exact same thing.

- the derivative of $f(x)$ at $x = a$
- the rate of change of $f(x)$ at $x = a$
- the slope of the graph of $f(x)$ at $x = a$

Since we've already dealt with slope and rate of change in 2.1, most of the problems in 2.2 are very similar. They simply use the new notation $f'(a)$. Given the graph of $f(x)$, you should understand the graphical meaning of $\frac{f(b) - f(a)}{b - a}$, $f(c)$, and $f'(d)$ for particular values of a, b, c, and d. Look at #1, 2, 3, 6, 9, 11, 16 from section 2.2.

2.3 Given a function $y = f(x)$, we learned how to compute $f'(a)$ at any point $x = a$. So we see that $f'(x)$ is itself a function. Given a graph of $f(x)$, you should be able to sketch a graph of $f'(x)$. Remember that in the graph of $f'(x)$, the $y - values$ are just recording what the slopes are in the graph of $f(x)$. Another problem may give you information about $f'(x)$ and ask you to sketch a graph of $f(x)$. Knowing where $f'(x)$ is positive, negative, or zero tells you where $f(x)$ is increasing, decreasing, or constant – this enables you to sketch a graph of $f(x)$. Look at #1, 13, 15, 17, 26, 27, 28, 32 from section 2.3.

2.4 In this section you are asked to give the practical meaning of statements such as $f(8) = 100$ and $f'(8) = 4$. Knowing the units for $f(x)$ and $f'(x)$ makes this easier to do. You should also be able to use the above information to approximate $f(9)$, $f(8.1)$, $f(7.3)$, etc. Look at #1, 2, 8, 10, 11, 12, 15 from section 2.4.

Chapter 4 (sections 1–4)

Know what the derivative means and know how to apply this to problems like the following (or to those from chapter 2):

- Given a formula for some quantity, find the rate at which that quantity is changing. Look at #27, 36, 37 from 4.1, and #27, 30, 37 from 4.2.
- Sketch the graph of $f(x) =$ *some formula*. Find the slope of this curve at any given point. Look at #22 from 4.1.
- The position of an object is given by *some formula*. Find a formula for the velocity of that object and answer questions about the position and velocity of the object. Look at #43 from 4.1.

(Turn over for 2nd page)

Chapter 4 (sections 1–4)

Given a formula for a function, be able to find a formula for the derivative of that function using the rules below. Look at #1–21 from 4.1, and #1–21 from 4.2.

If n, m, b, c, and a are constants ($a > 0$), then

- $f(x) = c \implies f'(x) = 0$
- $f(x) = mx + b \implies f'(x) = m$
- $f(x) = x^n \implies f'(x) = nx^{n-1}$
- $f(x) = a^x \implies f'(x) = \ln a \cdot a^x$
- $f(x) = e^x \implies f'(x) = e^x$
- $f(x) = \ln x \implies f'(x) = \frac{1}{x}$
- $f(x) = g(x) \pm h(x) \implies f'(x) = g'(x) \pm h'(x)$
- $f(x) = cg(x) \implies f'(x) = cg'(x)$

Notes

- You should bring your own calculator and use it to find the derivative of a function at a particular point. You should also be able to use its graphing and table features effectively. Once you get a good graph, you should be able to use the built-in features which allow you to find where two curves intersect, or the maximum point on a curve.
- The test will be in class on Monday, June 17, 2002. No make-ups will be given for any reason.

(Turn over for 1st page)