MATH 1426 (Sec 101, 301 & 302) INFORMATION SHEET FOR MIDTERM 1 SPRING 2006

MIDTERM 1 is in PKH 319, 6:00-8:00 pm on Fri Feb 17

- See above for date, time and location of MIDTERM 1.
- The material covered on MIDTERM 1 is the same as that covered on the homework and on the worksheets through §3.2 inclusive. For homework, see www.uta.edu/faculty/retakh/1426/assignments.html
- Ken and I are available during our office hours (see syllabi).
- This MIDTERM will be, in part, multiple choice. Half of the points will be for the multiple-choice part, and the other half for the show-your-work part. There will be 5 choices of answer per multiple-choice question and, for each, only one answer will be the correct one. You should do rough work on the MIDTERM or on paper provided by me. You should bring with you to the MIDTERM a scantron form,

  882-ES or 882-E, a number-2 pencil, an allowed graphing calculator, and photo ID.

- A good (and usually effective!) way to review is to go over the homework problems you have not already done and make sure you understand all the homework well, the worksheets well and the quizzes well. I also recommend that you look through Midterm 1 from Fall 2003 and Spring 2004 which are posted at

  www.uta.edu/faculty/retakh/1426/exams.html

  I recommend that you time yourself while working on those tests, without access to your notes. In addition, this information sheet provides some more practice problems; you will spend Wed Feb 15 working on these and other questions individually (or in groups) in class. These practice questions do NOT form a model for the midterm. These questions are intended only to help you identify any gaps in your understanding. In the last 24 hours before the midterm, reread ALL the homework problems including the worksheet questions, skim through the lecture notes, and go over the quizzes and these practice questions again.
- Learn some basic trigonometric substitutions, quadratic formula, pythagorean formula and formulas from this class. Learn some simple graphs, such as those given on Page 27 of your book.
- Bring with you to the MIDTERM a working calculator (with working batteries!), satisfying the criteria on the first-day handout, and some form of photo ID (e,g either a driver license or your UTA ID). I will ask to see the ID when you turn in your MIDTERM to me. In particular, calculators with keyboards or with internet capability are not permitted on the MIDTERM. Cell phones should be out of sight and switched off.
- Try to keep your eyes on your own work during the MIDTERM.
- If you wish to leave the room during the MIDTERM, you should ask permission first and turn in your MIDTERM to me. Only in exceptional circumstances will I let you continue the MIDTERM should you return. (So it is better to be 3 minutes late to the MIDTERM, rather than ask to go to the bathroom during the MIDTERM.) If you finish early but prefer to stay in the room, then you should NOT get out any work, book nor item, no matter what the subject matter is. Should you wish to leave the MIDTERM early, then you may.
- It is your responsibility to be on time.

PRACTICE QUESTIONS

Questions 2-8 are questions occurring on previous midterms.

1. [§2.4] If $\log_{\sqrt[3]{b}} a = 3$, then
   $\boxed{\text{(a)}}\ a = b$ (b) $a = 2b$ (c) $b = 2a$ (d) $b = 3a$ (e) $a = 3b$.

2. [§2.4] Some money, P dollars, is invested so that, after t years, the total amount of money is given by $P \cdot 2^{kt}$ dollars, where k is a constant. The total amount doubles every 6 years. Find the exact value of k.

3. [§2.3: 39, 40] Find a constant k such that $f(x) = \begin{cases} 3x + k & x \le -2 \\ 2x & x > -2 \end{cases}$ is continuous for all x.
   In particular, using your value of k, justify why f is continuous on $(-\infty, \infty)$.

4. [§2.3: 39, 40] Let a and b be constants and define $f(x) = \begin{cases} -x^2 + a & \text{if } x < 0 \\ x^2 + b & \text{if } x \ge 0 \end{cases}$.
   (a) How should a and b be related to each other in order for f to be a continuous function on $(-\infty, \infty)$?
   (b) How should the values of a and b be restricted in order for f to be a continuous function on $(-\infty, \infty)$?

5. (a) [§2.2: 18] Find the exact limit, $\lim_{x \to 2} \left(\dfrac{\sqrt{x+2} - 2}{x - 2} \right)$, if it exists; explain.
   (b) [§2.2: 43, 57] Find the exact limit, $\lim_{x \to 1} f(x)$, if it exists, where f is defined by
   $f(x) = \begin{cases} 2x & \text{if } x \le 1 \\ 2 & \text{if } x > 1 \end{cases}$; explain.
   (c) [§2.2: 21] Find the exact limit, $\lim_{x \to 2} \left(\dfrac{\sin(x-2)}{\sqrt{x-2}} \right)$, if it exists; explain.

6. [§3.1] Justify the claim that $y = 4x^3 + 9x - 3$ has no horizontal tangent line.

7. [§3.1] In this question, $f(x) = \sqrt{3x+2}$.
   (a) The derivative, f', of f is given by $f'(x) = \dfrac{3}{2\sqrt{3x+2}}$. Show that this formula for f' is correct by using only the limit of a difference quotient.
   (b) As in (a), $f'(x) = \dfrac{3}{2\sqrt{3x+2}}$. Find the equation of the tangent line to the graph of f at the point $\left(\dfrac{14}{3},\ 4 \right)$.

8. Suppose $f(x) = \sqrt{4x+3}$. Given that the derivative, f', of f is given by $f'(x) = \dfrac{2}{\sqrt{4x+3}}$, find the equation of the tangent line to the graph of f at the point $\left(\dfrac{11}{2}, 5 \right)$.
   $\boxed{\text{(a)}}\ y = \dfrac{2}{5}(x+7)$ (b) $y = 5 + \dfrac{1}{\sqrt{4x+3}}(2x-11)$ (c) $y = \dfrac{2}{5}(x+18)$ (d) $y = \dfrac{1}{5}(2x-11)$ (e) none of these.

9. If $g(x) = \begin{cases} 2x + 1 & \text{if } x \le -1 \\ 3x & \text{if } -1 < x < 1 \\ 2x - 1 & \text{if } x \ge 1 \end{cases}$, then g is discontinuous at
   (a) 0 only (b) 1 only $\boxed{\text{(c)}}$ -1 and 1 only (d) no point of the domain (e) every point of the domain.

10. [§2.4] Solve the equation $\log_3(x-1) - \log_3(x+1) = 2$.

11. If $v(t) = \begin{cases} \sqrt{-t} & \text{if } t < 0 \\ 1 & \text{if } 0 < t \le 1 \\ \sqrt{t} & \text{if } t > 1 \end{cases}$, then v is discontinuous at

[(a)] 0 only (b) 1 only (c) -1 and 1 only (d) nowhere (e) every point of the domain.

12. If $f(x) = \dfrac{\sqrt{x^2-9}}{2x-6}$, then $\lim\limits_{x\to 3^+} f(x)$ is (a) $-\infty$ (b) 0 (c) $\dfrac{\sqrt{6}}{2}$ (d) $\sqrt{6}$ [(e)] ∞.

13. If $p(s) = \dfrac{4-\sqrt{s}}{s-16}$, then $\lim\limits_{s\to 16} p(s)$ is (a) $-\infty$ [(b)] $-\dfrac{1}{8}$ (c) 0 (d) $\dfrac{1}{8}$ (e) ∞.

14. If $s(v) = \dfrac{v^2+2v-8}{v^4-16}$, then $\lim\limits_{v\to 2} s(v)$ is (a) $-\infty$ [(b)] $\dfrac{3}{16}$ (c) 1 (d) $\dfrac{3}{2}$ (e) ∞.

15. If $f(x) = \begin{cases} \sqrt{-x} & \text{if } x < 0 \\ 4-x & \text{if } 0 \le x < 4 \\ (x-4)^2 & \text{if } x > 4 \end{cases}$, then $\lim\limits_{x\to 0} f(x)$ is

(a) 0 (b) $\dfrac{1}{2}$ (c) 1 [(d)] does not exist (e) not enough information given.

16. If $f(x) = \begin{cases} \sqrt{-x} & \text{if } x < 0 \\ 4-x & \text{if } 0 \le x < 4 \\ (x-4)^2 & \text{if } x > 4 \end{cases}$, then $\lim\limits_{x\to 4^-} f(x)$ is

[(a)] 0 (b) $\dfrac{1}{2}$ (c) 1 (d) does not exist (e) not enough information given.

17. If $u(t) = \dfrac{|t-7|}{t-7}$, then $\lim\limits_{t\to 7^-} u(t)$ is (a) $-\infty$ [(b)] -1 (c) 0 (d) 1 (e) -7.

18. If $f(x) = \dfrac{\sin 3x}{5x}$, then $\lim\limits_{x\to 0} f(x)$ is

(a) $\dfrac{5}{3}$ [(b)] $\dfrac{3}{5}$ (c) 1 (d) 0 (e) does not exist.

19. [§3.1] Let $f(x) = \begin{cases} |x-1|, & \text{if } x \le 2 \\ x^2+3, & \text{if } x > 2 \end{cases}$.

(a) At what points is $f(x)$ continuous but not differentiable?

(b) At what points is $f(x)$ differentiable but not continuous?

20. [§3.1] Let $f(x) = \begin{cases} 9x & \text{if } x < 1 \\ \dfrac{1}{x} + 8 & \text{if } x \ge 1 \end{cases}$.

(a) Sketch the graph of f.

(b) Justify whether or not f is continuous on $(-\infty, \infty)$.

(c) Justify whether or not f is differentiable on $(-\infty, \infty)$.

21. [§3.2] The functions f and g and their first derivatives, f', g', are defined on $(-\infty, \infty)$, and, at $0, 1, 2$, they take on the values given in the following table.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
0	5	-1	2	-4
1	-3	3	1	-10
2	8	7	6	3

Let $F(x) = x^5 f(x)$ and find $F'(2)$ if it exists; if it does not exist, explain why not.

Let $G(x) = \dfrac{g(x)}{f(x)}$ and find $G'(0)$ if it exists; if it does not exist, explain why not.

Let $H(x) = \dfrac{g(x)}{f(2)}$ and find $H'(0)$ if it exists; if it does not exist, explain why not. (Note: this question can be done in less than 1 second! Think!)

Let $h(x) = e^{\ln g(x)}$ and find $h'(1)$ if it exists; if it does not exist, explain why not.

Let $R(x) = e^{\ln g(x)}$ and find $R'(0)$ if it exists; if it does not exist, explain why not.

22. Referring to the previous question, find the equation of the tangent line to the graph of $y = F(x)$ at the point with x-coordinate 2.

You should also look over your old quizzes, worksheet questions, and the homework assigned from the book so far.

Also look over supplemental problems and Midterm 1 from Fall 2003 and Spring 2004 which are posted at

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