Math 31 Sec 7 EXAM III 14 November 2003

[1] Name: _____

I pledge that I have neither given nor received any unauthorized assistance on this exam.

_____
(signature)

DIRECTIONS

1) Print your name and sign the honor pledge above. If the pledge is not signed, your exam will ***not*** be graded.

2) Check now that your test contains all ***5 pages*** and ***8 problems***.

3) You may use a calculator (except symbolic manipulators such as a TI-89, TI-92, or similar), but your answers must be given in their ***exact*** form. (i.e. $\sqrt{3}$ and not 1.73, π and not 3.14)

4) All work must be shown on this exam. ***No credit will be given for a correct answer without supporting work that leads to the answer***. When it is indicated that calculators are not to be used, clear non-calculator work must be shown.

5) Place a box around ***all*** of your final answers. Include units when necessary.

6) Notation and clarity count. Your job is to communicate mathematically; make what you are thinking clear.

7) Work quickly but thoroughly through the test. If you get stuck on a problem, move on to the next and return to it later after you've completed the problems you know how to do. ***Good Luck.***

1. Consider the function $g(x) = \dfrac{x^2}{2x-6}$.

[10] (a) Find all (global) maximum and minimum values of $g(x)$ on [-3,2].

[5] (b) Find the oblique asymptote of $g(x)$.

[5] (c) Write the EQUATIONS of all vertical asymptotes of $g(x)$.

[10] 2. Find two numbers whose product is -9 and the sum of whose squares is a minimum. Explicitly state why your value is a minimum.

3. Let $f(x) = x^3 - 5$.

[6] (a) State the iteration scheme ($x_{n+1} =?$) for Newton's Method.

[6] (b) Use this to approximate the positive root of $f(x)$ to five decimal places, starting with $x_1 = 2$.

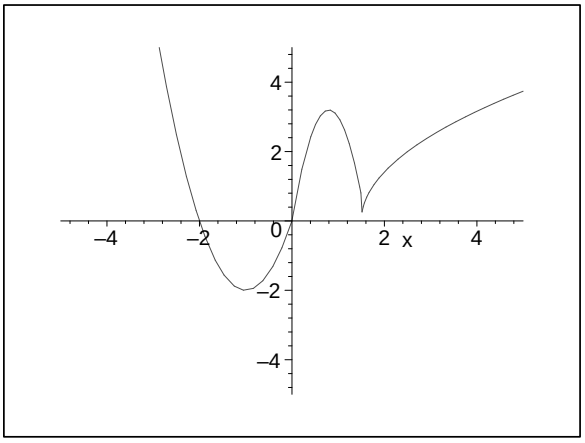
4. [8] (a) State the Mean Value Theorem for a function $f(x)$ defined on the interval $[a, b]$.

[6] (b) Find all c satisfying the conclusion of the Mean Value Theorem for $f(x) = x^3 - x$ on $[-1, 1]$.

[10] 5. Evaluate the following integral: $\int (x^3 - x)(3x^4 - 6x^2 + 2)^{5/3} dx$

[10] 6. If $f''(x) = \sin x$, find $f(x)$. Be careful with constants!

[8] 7. The following is a graph of the DERIVATIVE of a function f.



(a) On what intervals is f increasing?

(b) On what intervals is f concave down?

(c) What are the x-coordinates of the inflection points of f?

[15] 8. Sketch a graph of a continuous function f satisfying all of the following properties:

* f has a local maximum at $(-2, 4)$ and a local minimum at $(1, -3)$

* $f''(x) > 0$ on $(-\infty, -3) \cup (-1, 0) \cup (1, \infty)$

* $f''(x) < 0$ on $(-3, -1) \cup (0, 1)$

* $f'(0) = 0$

* f is increasing on $(-\infty, -2) \cup (1, \infty)$ and decreasing on $(-2, 1)$