

**Due: October 25, 2007 5:30 pm (during class)**

### DIRECTIONS

1. In accordance with syllabus policy (page 2, section on Academic Integrity) in order to receive credit for this assignment you must adhere to the instructions set forth in this assignment, as explained in these directions. Moreover, you must attach this page to the assignment, as a cover sheet, signed and dated. If you emailed the assignment to me, you must still hand in this signed and dated document, in order to receive credit.
2. You may consult with the instructor, the notes you took in class, and any text or URL. You may also consult with your fellow classmates, if you choose, *but* the solutions to the problems must be written up by your own hand individually. (In other words, ‘consulting’ here doesn’t mean copying what your fellow classmate does without understanding what you’re copying.) You may not, however, consult with any other faculty member at Capitol College or elsewhere. If you consulted any references, you should cite. Please adopt the following format when citing:

**(Example)**

“According to Eqn 1 [*Jones* (1992), 11] ...”

...where the complete reference of *Jones* is found in your list of references, stapled at the end of the assignment. The page number follows the date (in parentheses). Though standards in technical writing vary, I would prefer you list a citation in the following format:

**Example for a book:**

Jones, Robert. *Elementary Linear Algebra*. (Boston: Harcourt Press, 1992)

**Example for an article:**

Jones, Robert. “Boundary Value Equations: An Overview”. *American Mathematical Monthly*, vol. 3 n2 (1998), 1227-1135.

**Example for an electronic source, (website, pdf or other):**

Jones, Robert.(2003 – use date it was last updated if it is a webpage) “Some Properties of Orthogonal Functions” URL = <<http://www.jrworld.org/~jroberts/...> >

Please use discretion when citing. If you stumble across a formula in some source, which I have asked you to explicitly derive, you obviously cannot cite it. This is taken care of by the fact that you must show all your work in maximal reasonable detail. An answer with no work shown gets a 0.

I have read, understood, and have complied with the instructions set forth in this assignment

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(Signature)      (date)

**Directions:** Please complete the following problems listed below, in legible and neat form. Illegible work will not be graded, and marked with a 0 grade.

**I. (25)** Consider the function:  $f(x) = 2x^3 - 4x - 3$  on  $[1, 3]$ . In this problem, you are to find the *fixed point* of  $f(x)$ , i.e., the point  $c \in [1, 3]$  such that  $c = f(c)$ .

(a) (5) Prove that  $f(x)$  has a fixed point in  $[1, 3]$ . To do this, construct a function:

$g(x) = f(x) - x$ , and use the *Intermediate Value Theorem* on  $g(x)$ .<sup>1</sup>

(b) (20) Use the Newton-Raphson method to approximate the fixed point of  $f(x)$  (i.e., the roots of  $g(x)$ ), starting with  $x_0 = 2$ . Recall the Newton-Raphson algorithm

(discussed Tuesday, October 2):  $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ .

You're welcome to use a software application like Excel here!

**II. (25) a.) (8)** p. 225, exercise 28

b.) (7) p. 279, exercise 50

c.) (10) p. 288, exercise 32

**III. (25) a.) (5)** p. 300, exercise 22

b.) (10) p. 312, exercise 46

c.) (10) p. 320, exercise 34

**IV.) (25) Integration of exponential functions.**

a.) (5) Log on to <http://www.plu.edu/~heathdj/java/calc2/Integral.html>

Use the applet to determine the area under the curve  $y = 2.2^x$  for the domain:  $[0, 2]$

b.) (8) Verify your result in a.) by computing the integral by hand.

c.) (7) p. 369, exercise 24

d.) (5) p. 370, exercise 57

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<sup>1</sup> Recall from **August 30** notes: The **Intermediate Value Theorem (IVT)** (**Thm 2.11, page 74**) expresses a very attractive feature about continuous functions, namely that for any function  $f$  continuous on  $[a, b]$  we are *guaranteed* there exists *at least one point in the y-axis*  $f(c)$  such that:  $f(a) < f(c) < f(b)$  for any  $c \in (a, b)$ . In other words, any point between the endpoints on the domain is going to produce *at least one* y-value between the points  $f(a)$  and  $f(b)$  in the range.