Math 126 C - Spring 2008
Mid-Term Exam Number One
April 24, 2008

Name: _____ Section: _____

1	20	
2	20	
3	10	
4	20	
5	10	
Total	80	

- Complete all questions.
- You may use a scientific, non-graphing calculator during this examination. Other electronic devices are not allowed, and should be turned off for the duration of the exam.
- If you use a trial-and-error or guess-and-check method, or read a numerical solution from a graph on your calculator, when an algebraic method is available, you will not receive full credit.
- You may use one hand-written 8.5 by 11 inch page of notes.
- Show all work for full credit.
- You have 50 minutes to complete the exam.

.

1. Let $f(x) = \dfrac{1}{3 - \frac{1}{4}x}$.

   (a) Find the second-order Taylor polynomial $T_2(x)$ for $f(x)$ based at $b = 0$.

   (b) Give a bound on the error

   $$|f(x) - T_2(x)|$$

   for $-0.5 \leq x \leq 0.5$.

2. Let

$$h(x) = \int_0^x t \cos t^3 \, dt$$

(a) Find the first four non-zero terms of the Taylor series based at $b = 0$ for $h(x)$.

(b) Use your answer to part (a) to compute $h^{(20)}(0)$.

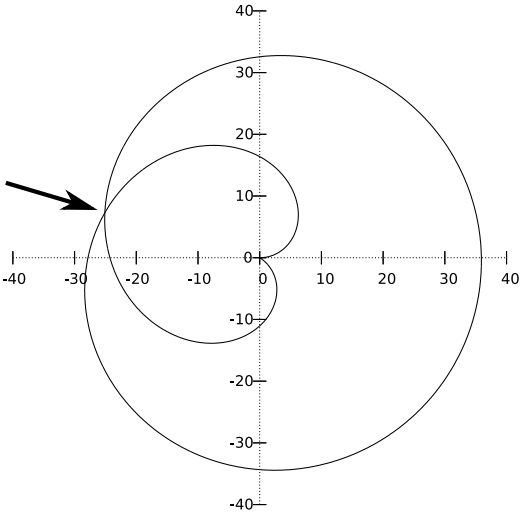
3. Find the first three non-zero terms of the Taylor series for

$$g(x) = \frac{x}{2 + x^2}$$

4. Consider the polar curve defined by the equation

$$r = \theta(12 - \theta)$$

for $0 \leq \theta \leq 12$. The curve is shown in the figure below.



(a) Find the slope of the tangent line to this curve at $\theta = \frac{\pi}{2}$.

(b) Find the value of θ corresponding to the self-intersection point indicated by the arrow.

5. There are infinitely many unit vectors which are orthogonal to the vector $\langle 3, -2, 4 \rangle$. Give an example of one of them.