**APPM 1340 — Exam #1 — October 1, 2008**

On the front of your bluebook print (1) your name, (2) your student ID number, and (3) a grading table. **Explain all of your answers.** A correct answer with no supporting work may receive no credit while an incorrect answer with some correct work may receive partial credit. No electronic devices of any kind (e.g. cell phones, calculators, etc.) are permitted.
**Each question is worth 10 points so it is possible to get up to 10 extra credit points.**

1. $f(x) = \begin{cases} -3x-3, & x < -2 \\ 1, & x = -2 \\ x^2 - 1, & x > -2 \end{cases}$

   (a) Sketch a graph of $f(x)$. Label any intercepts.

   (b) Does the $\lim_{x \to -2} f(x)$ exist? Explain your answer.

   (c) What is the average rate of change of the function $f(x)$ over the interval $(-2, 1)$?

2. State the formal definition of $\lim_{x \to x_0} f(x) = \mathrm{L}$.

3. Let $f(x) = \sqrt{x+6}$. Using the definition of a limit find a value for $\delta > 0$ when $x_0 = 10$, $\mathrm{L} = 4$ and $\epsilon = \frac{1}{2}$.

4. Sketch the graph of $y = -3\cos(\frac{1}{2}x)$. Be sure to label your graph well.

5. Is $y = -3\cos(\frac{1}{2}x)$ an even function, an odd function or neither? Justify your answer either algebraically or by referring to the graph in # 4.

6. Find the value of all 6 basic trig functions for the angle $\theta = \frac{5\pi}{3}$.

7. Explain in your own words what $|x - 10| \geq 3$ means and graph this on the real number line.

8. Using one of the trig identities you have learned find the exact value of $\cos^2(\frac{-\pi}{8})$.

9. Find the equation of the line L from the point P(2, -1) to the point Q(-3, 5) *and* the equation of the line M that is perpendicular to the line L and passes through the point Q.

10. Evaluate each of the following limits.

    (a) $\lim_{x \to 0} \dfrac{5x^3 + 8x^2}{3x^4 - 16x^2}$

    (b) $\lim_{x \to 3^+} \dfrac{1}{x-3}$

    (c) $\lim_{x \to -5} x^2 - 10x + 1$

11. Find the center and radius of the circle $x^2 + y^2 - 3y + 8x = 0$ and sketch its graph. Be sure to label your graph with the center of the circle and at least two points on the circle.