Test 1 **MA 125 - 02 (Form A)** **September 12, 2016**

Name: _____ **Signature:** _____

SHOW ALL YOUR WORK!

1. [16 points] Given the line $l : 2x + 3y = 5$.

   a) (8 points) Find the equation of the line l_1 that is parallel to l and passes through the point $(-1, 1)$.

   b) (8 points) Find the equation of the line l_2 that is perpendicular to l and passes through the point $(0, 1)$.

2. [8 points] Assuming that $0 < \theta < \dfrac{\pi}{2}$ and given that $x = 2\cos\theta$, simplify the following expression $\dfrac{\sqrt{4-x^2}}{5x}$.

3. [16 points] Evaluate the following limits:

   (a) (8 points) $\lim\limits_{x\to\infty} \dfrac{2e^{-x}+10}{4e^{-x}-5}$

   (b) (8 points) $\lim\limits_{t\to-2} \dfrac{t^2+5t+6}{t+2}$

4. [13 points] The initial number of bacteria in the culture is 1000. After 3 hours there are 8000 bacteria in the culture. Assuming exponential growth

   a) (8 points) Find the formula for the number of bacteria in the culture, $N(t)$, after t hours.

   b) (5 points) How many bacteria are there after 9 hours.

5. [15 points] Find the value of k making the function f continuous on $[0, 5]$

$$f(x) = \begin{cases} e^{kx}, & 0 \leq x < 2; \\ x + 1, & 2 \leq x \leq 5. \end{cases}$$

6. [32 points] Consider the function

$$f(x) = \begin{cases} x+1 & \text{for } x < 1 \\ 3 - x^2 & \text{for } x \geq 1 \end{cases}$$

(a) (8 points) Evaluate $\lim_{x \to 1^-} f(x)$

(b) (8 points) Evaluate $\lim_{x \to 1^+} f(x)$

(c) (8 points) Is this function continuous at $x = 1$? (Justify your answer)

(d) (8 points) Evaluate $\lim_{x \to \infty} \frac{f(x)}{x^2+1}$ and $\lim_{x \to -\infty} \frac{f(x)}{x^2+1}$