Calculus I Exam #4
Fall 2012
Sections 4.7-5.5

Make sure you show all of your work on this paper. Solutions without correct supporting work will not earn credit. No calculators may be used on this exam.

1. a. Evaluate: \( \lim_{x \to 0} \frac{7x + 7 - 7\cos x}{\sin 3x} = \) ________________

   b. Evaluate: \( \lim_{x \to 0} \frac{2 + e^x}{x^2 + 3x - 1} = \) ________________

2. Evaluate: \( \lim_{x \to \infty} x \sin \frac{1}{x} = \) ________________

3. Evaluate: \( \lim_{x \to 0} (1 + 4x)^{3/x} = \) ________________
4. a. Evaluate: \( \int \left( x^2 - \frac{3}{x} + \sec x \tan x \right) \, dx = \) _________________

b. Evaluate: \( \int (\sqrt{x^2} + \sin x - 5) \, dx = \) _________________

5. **Use the definition of the definite integral** to evaluate \( \int_{1}^{5} (1 - x) \, dx \). No credit will be earned for the correct answer if the definition of the definite integral is not used.
6. Find the area of the region above the x-axis bounded by \( f(x) = 4 - x^2 \).

7. a. Find the average value of \( f(x) = x + 1 \) over the interval [1,4].

b. \( \int \frac{\sin x}{\cos^3 x} \, dx = \underline{\text{______________________________________________________________}} \)

8. On a celestial body, the acceleration due to gravity is -2 meters per second per second. An alien throws a stone upwards from a cliff with an initial velocity of 5 meters per second and the stone is 20 meters above the surface after 3 seconds.

   a. How high is the cliff?

b. What was the velocity of the stone upon impact with the surface?
9. a. Evaluate: \( \int \frac{1 + 5x + x^2}{\sqrt{x}} \, dx = \) 

b. Evaluate: \( \int_0^1 x \sqrt{1 - x^2} \, dx = \) 

10. a. Evaluate: \( \int \frac{1}{9 + x^2} \, dx = \) 

b. Evaluate: \( \int_{-1}^{2} x^2 e^{x^3 + 1} \, dx = \)