EXAM I

Show all your work! Be sure to show your algebra- an answer with no work will receive no credit. You may not use rules of calculus that we have not discussed to justify an answer.

1. (10 points)

    (a) State the definition of the derivative of f at $x = a$:

    (b) Finish the definition: f is continuous at $x = a$ if:

2. (10 pts) Find $h'(1)$ using the definition, if $h(t) = \sqrt{1 + 2t}$.

3. (10 points) Find the values of a and b so that $f(x)$ is continuous for all x:

$$f(x) = \begin{cases} 4a - x^2, & \text{if } x < 3 \\ b, & \text{if } x = 3 \\ 3 - ax, & \text{if } x > 3 \end{cases}$$

(Be sure your answer shows that you understand the definition of continuity)

4. (10 points) Where is the function continuous?

$$f(x) = \frac{1}{\sqrt{x^2 - 9}}$$

5. (10 points) Give the exact value:

   (a) $\cos(10\pi/3)$

   (b) $\cot(\pi/4)$

   (c) $\arcsin(1)$

6. (15 pts) Find the equation of the tangent line to $y = \dfrac{2}{1 - 3x}$ at $x = 0$.

7. (15 points) Find each limit, if it exists.

(a) $\displaystyle\lim_{x \to -1} \dfrac{x^2 - 4x}{x^2 - 3x - 4}$

(b) $\displaystyle\lim_{x \to -\infty} \dfrac{\sqrt{4x^2 + 1}}{x + 1}$

8. (20 pts) Short Answer:

   (a) Show that there must be at least one real solution to $x^5 - x^3 + 3x - 5 = 0$.

   (b) Simplify: $\sin(\cos^{-1}(x))$.

   (c) If $\quad 2x + 1 \le f(x) \le x^2 + 2 \quad$ for all x, then what is $\lim_{x \to 1} f(x)$? (Give a short justification)

   (d) Compute $\log_3(45) - \log_3(10) + \log_3(54)$