SCORE_____

1. Use the Squeeze theorem to find the $\lim_{x \to 0} f(x)$ if

$$3 - x^3 \leq f(x) \leq 3 + x^3.$$

[5 points]

2. Evaluate the following

$$\lim_{x \to 2} \frac{x + 2}{x^2 + 3x + 5}.$$

[5 points]

3. Give the formal definition of a limit.

[5 points]

4. Find a suitable δ which proves that

$$\lim_{x \to -3}(9 - 2x) = 15$$

[6 points]

5. Find the following limit L. Then find $\delta > 0$ such that $|f(x) - L| < 0.01$ whenever $0 < |x - a| < \delta$.

$$\lim_{x \to 2}(2x + 8)$$

[6 points]

6. Find the x-values (if any) at which f is not continuous.

$$f(x) = \frac{x + 1}{x^2 - 4x + 3}$$

[8 points]

7. Use the Intermediate Value Theorem to show that there is a c, $a \leq c \leq b$, such that $f(c) = 9$ on the interval $[0, 5]$.

$$f(x) = x^2 + x - 1$$

[8 points]

8. Evaluate the following limit

$$\lim_{x \to \infty} \frac{\sqrt{4x^2 - 2}}{3x + 1}.$$

[8 points]

9. Determine the vertical and horizontal asymptotes (if any exist) of the following function

$$f(x) = \frac{3x - 15}{x^2 - 25}.$$

[10 points]

10. Using the limit definition, find the derivative of $f(x) = x^2 + x - 1$.

[8 points]

11. Using the limit definition, find the derivative of $f(x) = \dfrac{2}{x+1}$.

[8 points]

12. Find the derivative of $f(x) = 2x^4 - 3x^2 + \pi x - 18$.

[7 points]

13. Find the derivative of $f(x) = 6x^5 + \dfrac{8}{x^2} - 3e^x$

[7 points]

Bonus. Do only one of the

(a) Prove that $\lim_{x\to 0} \dfrac{\cos x - 1}{x} = 0$, (b) Find a suitable δ which proves $\lim_{x\to a} \dfrac{1}{\sqrt{x}} = \dfrac{1}{\sqrt{a}}$

[6 points]