Exercise Set 2 (Total Points: 100)

Limits to Finite Points (5 points each)

1. Consider the function $f(x) = \dfrac{x-1}{(x-1)(x-2)(x-3).}$ Find $\lim_{x\to 1} f(x)$.
2. Consider the function $g(x) = \operatorname{sgn}(x) + 2$. Find $\lim_{x\to 0} g(x)$.
3. Find $\lim_{x\to 3} \dfrac{x^2-5x+6}{x^2-6x+9}$.
4. Find $\lim_{h\to 0} 1 + h + h^2$.
5. Consider the piecewise function

$$a(x) = \begin{cases} x^2 - 1 & \text{if } x > 6 \\ 9 & \text{if } x = 6 \\ 6x - 1 & \text{if } 1 < x < 6 \\ x^2 & \text{if } x = 1 \\ 5 & \text{if } x < 1. \end{cases}$$

   Find $\lim_{x\to 1} a(x)$.

6. Keep a as the same function from the previous problem. Find $\lim_{t\to 6} a(t)$.

Limits to Infinity (5 points each)

7. Find the limit $\lim_{x\to\infty} e^x$.
8. Find the limit $\lim_{x\to-\infty} e^x$.
9. Find the limit $\lim_{x\to-\infty} 4 + 2e^x$.
10. Find the limit $\lim_{x\to\infty} \frac{1}{x}$.
11. Find the limit $\lim_{x\to-\infty} \frac{1}{x^2} - \frac{1}{5x} + 3$.
12. Find the limit $\lim_{x\to\infty} \frac{2x+1}{4x^2+4x+1}$.
13. Find the limit $\lim_{x\to-\infty} \frac{5x+3}{15x-2}$.
14. Find the limit $\lim_{x\to\infty} \frac{-4x^2-3x+1}{x^2+1}$.

Review (3 points each)

15. Find $\sin(\pi/3)$.
16. Find $\cos(5\pi/6)$.
17. Find $\sin(5\pi/4)$.
18. Evaluate $\ln(e^5 \cdot e^2)$.
19. Evaluate $10^{\log_{10}(71)}$.
20. Suppose a and b are angles such that $\sin(a) = 3/5$ and $\cos(b) = 5/12$. Use the pythagorean identity $\sin^2(x) + \cos^2(x) = 1$, to find $\cos(a)$.
21. Using a and b from the previous problem, find $\sin(b)$.
22. Find $\sin(-a)$
23. Find $\sin(a + b)$.
24. Sketch a graph of $e^x - 3$.