

Calculus Workshop #4

1. Compute the following limits without graphing the function:

(a) $\lim_{x \rightarrow -3} \frac{x^2 + 6x + 9}{x^2 + 2x - 3}$

(b) $\lim_{x \rightarrow \frac{1}{3}} \frac{3x - 1}{6x^2 + x - 1}$

(c) $\lim_{x \rightarrow 2} \frac{x^3 - 2x^2 + x - 2}{x^2 + x - 6}$

(d) $\lim_{x \rightarrow 4} \frac{\frac{x}{x-2} - x + 2}{x - 4}$

(e) $\lim_{x \rightarrow \pi} \frac{1 + \cos x}{\cos x}$

(f) $\lim_{x \rightarrow 9} \frac{x - \sqrt{x}}{x + \sqrt{x}}$

(g) $\lim_{x \rightarrow 0} \frac{\frac{1}{(3+x)^2} - \frac{1}{9}}{x}$

2. Sketch a graph of a function $f(x)$ for which the following are all true:

• $\lim_{x \rightarrow -3} f(x) = \infty$

• $\lim_{x \rightarrow -1} f(x) = 2$

• $f(-1) = -2$

• $\lim_{x \rightarrow 0^-} f(x) = 0$

• $\lim_{x \rightarrow 0^+} f(x) = -1$

• $\lim_{x \rightarrow 2} f(x)$ does not exist

• $\lim_{x \rightarrow 3} f(x)$ does not exist, but $\lim_{x \rightarrow 3^-} f(x)$ and $\lim_{x \rightarrow 3^+} f(x)$ do exist