

MATH 3A COMPUTING LIMITS

Recall. Derivative of a function:

I. Properties of limits

a) Addition and Subtraction:

b) Multiplication:

c) Division:

II. Techniques to compute limits

a) Use continuity

b) Factor and cancel

c) Use conjugate

III. Practice

1. Compute the following limits.

a) $\lim_{x \rightarrow 0} x^5(1 + 6x^2) =$

b) $\lim_{a \rightarrow 3} \frac{x-3}{x^2-x-6} =$

c) $\lim_{y \rightarrow -2} \left(\frac{\sqrt{y+4}}{y} + 2^y \right) =$

d) $\lim_{h \rightarrow 0} \frac{(x+h)^2 - x^2}{h} =$

(Your answer will contain x .)

e) $\lim_{s \rightarrow 1} \frac{1-s}{1-\sqrt{s}} =$

(Hint: Use conjugate.)

2. Suppose

$$\lim_{x \rightarrow a} g(x) = -5, \quad \lim_{x \rightarrow a} h(x) = 2, \quad \text{and} \quad \lim_{x \rightarrow a} f(x) = 0.$$

Find the following limits if they exist. If it is infinity or does not exist, write DNE.

a) $\lim_{x \rightarrow a} (g(x) + h(x)) =$

b) $\lim_{x \rightarrow a} \sqrt{f(x)} =$

c) $\lim_{x \rightarrow a} \frac{g(x)}{h(x)} =$

d) $\lim_{x \rightarrow a} \frac{1}{h(x)-2} =$

e) $\lim_{x \rightarrow a} \left(3g(x) - \frac{1}{h(x)} \right) =$

f) $\lim_{x \rightarrow a} g(x)^2 h(x) =$

3. A challenging question: What about this limit?

$$\lim_{x \rightarrow 0} \left(x \sin\left(\frac{1}{x}\right) \right) =$$