

PRACTICE PROBLEMS ON LIMITS

Compute the following limits.

$$(1) \lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 5}}{x + 5} = 1.$$

$$(2) \lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 5x}}{x^2 + 5} = 0.$$

$$(3) \lim_{x \rightarrow 4} \frac{x^2 - 5x + 4}{x^2 - 16} = 3/8$$

$$(4) \lim_{x \rightarrow \infty} \frac{\sin x}{x} = 0$$

$$(5) \lim_{x \rightarrow 0} \frac{\cos x}{x} \text{ does not exist.}$$

$$(6) \lim_{x \rightarrow \infty} (3^x - 2^x) = +\infty. \text{ (Why? We have } 3^x - 2^x = 2^x((3/2)^x - 1) \text{ and both factors go to } +\infty \text{ as } x \text{ goes to } +\infty \text{).}$$

$$(7) \lim_{x \rightarrow 0} \frac{e^x - 1}{x} = 1 \text{ (This is the derivative of } e^x \text{ at } x = 0, \text{ which by our definition of } e \text{ equals 1).}$$

$$(8) \lim_{x \rightarrow -1^-} \frac{x}{x + 1} = +\infty.$$

$$(9) \lim_{x \rightarrow \infty} \frac{\sqrt{x + 1/x}}{\sqrt{5x + 5/x}} = 1/\sqrt{5}$$