

Name: ANSWERSInstructions: No calculators! Answer all problems in the space provided! Do your rough work on scrap paper.

1. Suppose $f(x) = 2 - x - x^2$. Find $\lim_{h \rightarrow 0} \frac{f(3+h) - f(3)}{h} = \underline{-7}$

2. Compute the following limits:

(a) $\lim_{h \rightarrow 0} \frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h} = \underline{\frac{2}{x^3}}$

(b) $\lim_{x \rightarrow -\infty} \frac{2-x}{4-x^2} = \underline{0}$

(c) $\lim_{t \rightarrow \infty} \frac{(2t^2 + 1)^2}{(t+1)^2(4t^2 + t)} = \underline{1}$

(d) $\lim_{x \rightarrow -\infty} \frac{4x^2 - 9x^3}{5 - 3x^3} = \underline{3}$

3. With an equation, define " $f(x)$ is continuous at $x = a$ ": $\lim_{x \rightarrow a} f(x) = f(a)$

Bonus:

1. Define $f'(x) = \underline{\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}}$ OR $\underline{\lim_{b \rightarrow a} \frac{f(b) - f(a)}{b-a}}$

2. In terms of derivatives, describe the following:

(a) $f(x)$ is increasing: $\underline{f'(x) > 0}$

(b) $f(x)$ is concave down: $\underline{f''(x) < 0}$