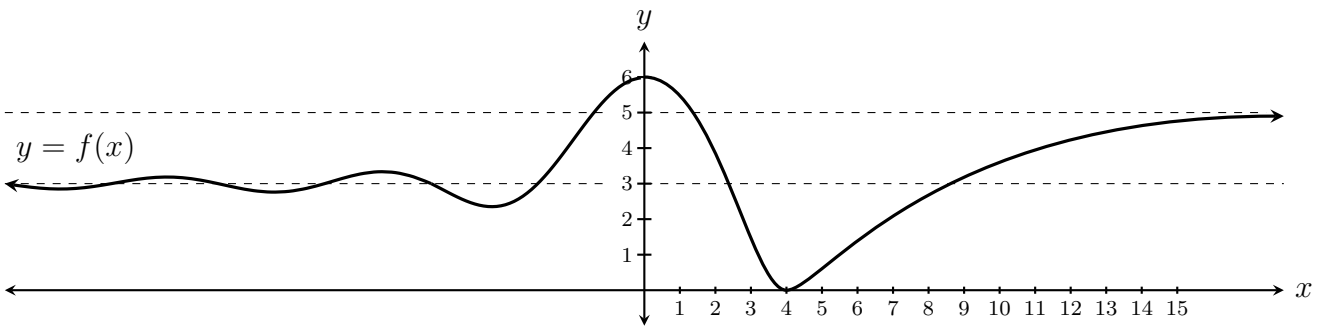
Name: _____

Quiz 4

MATH 200
February 1, 2022

Directions: Find the limits. Show all steps. Simplify your answer.

1. (8 points) Answer the following questions about the function $y = f(x)$ graphed below.



(a) $\lim_{x\to-\infty} f(x) = \boxed{3}$

(b) $\lim_{x\to\infty} f(x) = \boxed{5}$

(c) $\lim_{x\to\infty} \dfrac{1}{f(x)} = \dfrac{\lim_{x\to\infty} 1}{\lim_{x\to\infty} f(x)} = \boxed{\dfrac{1}{5}}$

(d) $\lim_{x\to\infty} f\left(\dfrac{1}{x}\right) = f\left(\lim_{x\to\infty} \dfrac{1}{x}\right) = f(0) = \boxed{6}$

(e) $\lim_{x\to 4^-} \dfrac{1}{f(x)} = \boxed{\infty}$ (Bottom approaches 0, and is positive)

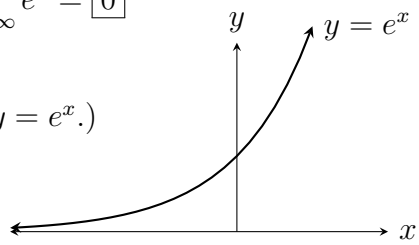
(f) $\lim_{x\to 4^+} \dfrac{1}{f(x)} = \boxed{\infty}$ (Bottom approaches 0, and is positive)

(g) $\lim_{x\to 0} \dfrac{x}{f(x)} = \dfrac{\lim_{x\to 0} x}{\lim_{x\to 0} f(x)} = \dfrac{0}{6} = \boxed{0}$

(h) $\lim_{x\to 0^+} \dfrac{f(x)}{x} = \boxed{\infty}$ (Top approaches 6. Bottom approaches 0, and is positive)

2. (4 points) $\lim_{x\to-\infty} e^x = \boxed{0}$

(From graph of $y = e^x$.)



3. (4 points) $\lim_{x\to 5^+} \dfrac{x^2+2x+1}{-x^2+4x+5} = \lim_{x\to 5^+} \dfrac{(x+1)(x+1)}{(-x+5)(x+1)} = \lim_{x\to 5^+} \dfrac{x+1}{-x+5} = \boxed{-\infty}$ (Top approaches 6. Bottom approaches 0, and is *negative*)

4. (4 points) $\lim_{x\to\infty} \dfrac{x^2+2x+1}{-x^2+4x+5} = \lim_{x\to\infty} \dfrac{x^2+2x+1}{-x^2+4x+5} \cdot \dfrac{\frac{1}{x^2}}{\frac{1}{x^2}} = \lim_{x\to\infty} \dfrac{1+\frac{2}{x}+\frac{1}{x^2}}{-1+\frac{4}{x}+\frac{5}{x^2}} = \dfrac{1+0+0}{-1-0} = \boxed{-1}$

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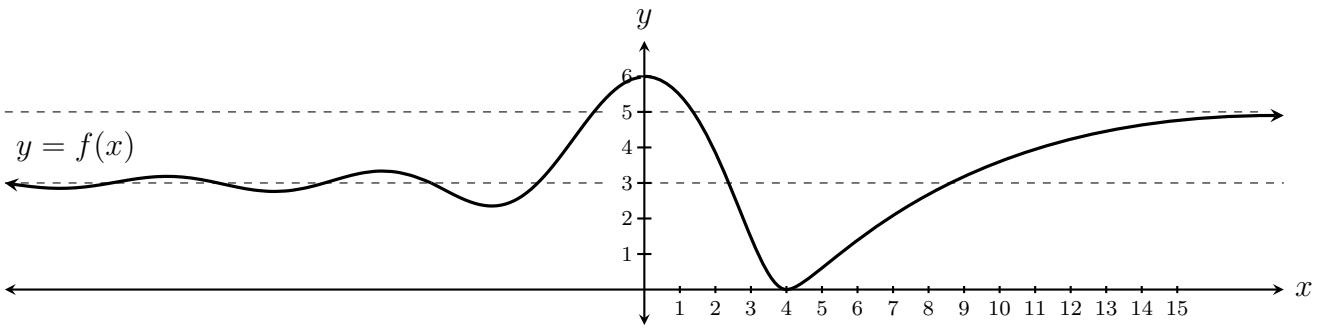


(a) $\lim_{x\to-\infty} f(x) = \boxed{3}$

(b) $\lim_{x\to\infty} f(x) = \boxed{5}$

(c) $\lim_{x\to 4^-} \dfrac{1}{f(x)} = \boxed{\infty}$ (Bottom approaches 0, and is positive)

(d) $\lim_{x\to 4^+} \dfrac{1}{f(x)} = \boxed{\infty}$ (Bottom approaches 0, and is positive)

(e) $\lim_{x\to-\infty} \dfrac{1}{f(x)} = \dfrac{\lim_{x\to-\infty} 1}{\lim_{x\to-\infty} f(x)} = \boxed{\dfrac{1}{3}}$

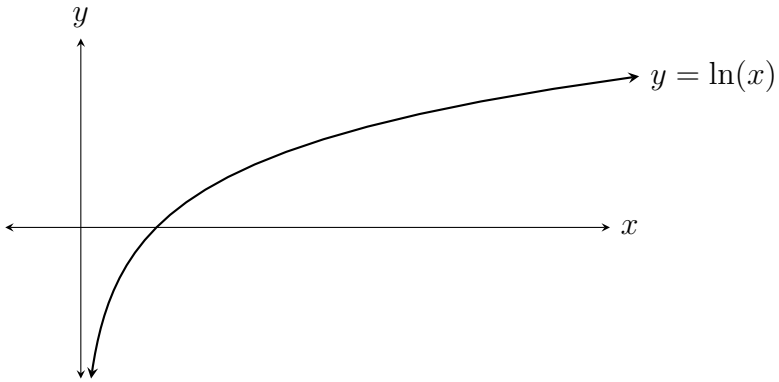
(f) $\lim_{x\to\infty} f\left(\frac{1}{x}+4\right) = f\left(\lim_{x\to\infty}\left(\frac{1}{x}+4\right)\right) = f(0+4) = f(4) = \boxed{0}$

(g) $\lim_{x\to 0^-} \dfrac{f(x)}{x} = \boxed{-\infty}$ (Top approaches 6. Bottom approaches 0, and is *negative*)

(h) $\lim_{x\to 0} \dfrac{x}{f(x)} = \dfrac{\lim_{x\to 0} x}{\lim_{x\to 0} f(x)} = \dfrac{0}{6} = \boxed{0}$

2. (4 points) $\lim_{x\to 0^+} \ln(x) = \boxed{-\infty}$

(From graph of $y = \ln(x)$.)



3. (4 points) $\lim_{x\to\infty} \dfrac{x^2+5x+6}{x^2-9} = \lim_{x\to\infty} \dfrac{x^2+5x+6}{x^2-9} \cdot \dfrac{\frac{1}{x^2}}{\frac{1}{x^2}} = \lim_{x\to\infty} \dfrac{1+\frac{5}{x}+\frac{6}{x^2}}{1-\frac{9}{x^2}} = \dfrac{1+0+0}{1-0} = \boxed{1}$

4. (4 points) $\lim_{x\to 3^+} \dfrac{x^2+5x+6}{x^2-9} = \lim_{x\to 3^+} \dfrac{(x+2)(x+3)}{(x-3)(x+3)} = \lim_{x\to 3^+} \dfrac{x+2}{x-3} = \boxed{\infty}$ (Top approaches 5. Bottom approaches 0, and is positive)