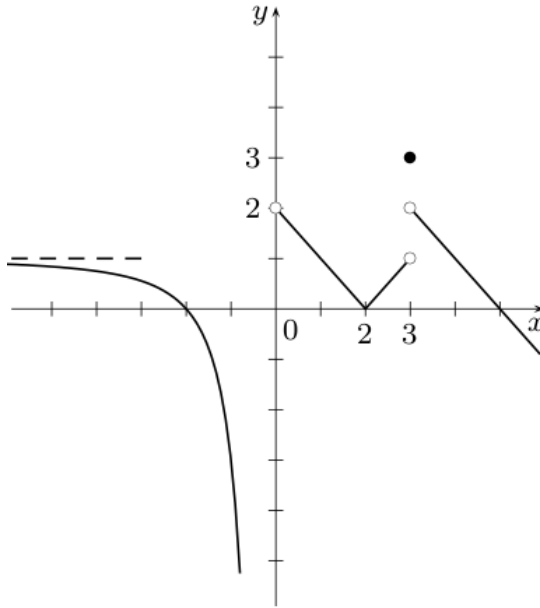


## 201-103-RE - Calculus 1

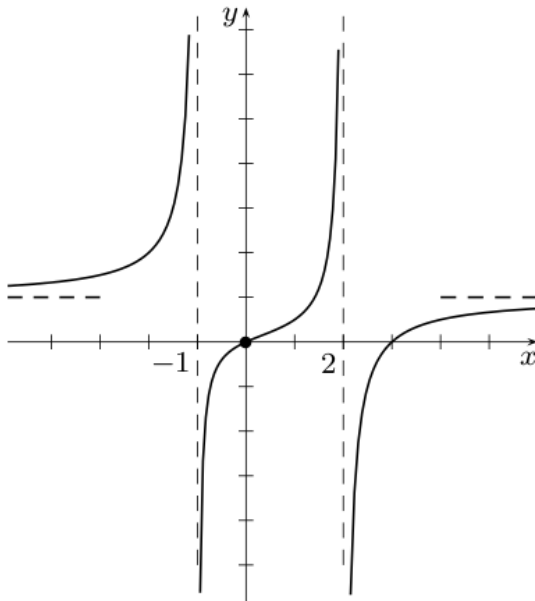
### WORKSHEET: LIMITS

1. Use the graph of the function  $f(x)$  to answer each question.  
Use  $\infty$ ,  $-\infty$  or  $DNE$  where appropriate.



- (a)  $f(0) =$
- (b)  $f(2) =$
- (c)  $f(3) =$
- (d)  $\lim_{x \rightarrow 0^-} f(x) =$
- (e)  $\lim_{x \rightarrow 0} f(x) =$
- (f)  $\lim_{x \rightarrow 3^+} f(x) =$
- (g)  $\lim_{x \rightarrow 3} f(x) =$
- (h)  $\lim_{x \rightarrow -\infty} f(x) =$

2. Use the graph of the function  $f(x)$  to answer each question.  
Use  $\infty$ ,  $-\infty$  or  $DNE$  where appropriate.



- (a)  $f(0) =$
- (b)  $f(2) =$
- (c)  $f(3) =$
- (d)  $\lim_{x \rightarrow -1} f(x) =$
- (e)  $\lim_{x \rightarrow 0} f(x) =$
- (f)  $\lim_{x \rightarrow 2^+} f(x) =$
- (g)  $\lim_{x \rightarrow \infty} f(x) =$

3. Evaluate each limit using algebraic techniques.  
Use  $\infty$ ,  $-\infty$  or *DNE* where appropriate.

$$(a) \lim_{x \rightarrow 0} \frac{x^2 - 25}{x^2 - 4x - 5}$$

$$(b) \lim_{x \rightarrow 5} \frac{x^2 - 25}{x^2 - 4x - 5}$$

$$(c) \lim_{x \rightarrow 1} \frac{7x^2 - 4x - 3}{3x^2 - 4x + 1}$$

$$(d) \lim_{x \rightarrow -2} \frac{x^4 + 5x^3 + 6x^2}{x^2(x+1) - 4(x+1)}$$

$$(e) \lim_{x \rightarrow -3} |x+1| + \frac{3}{x}$$

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

$$(g) \lim_{x \rightarrow 3} \frac{\sqrt{x^2 + 7} - 3}{x + 3}$$

$$(h) \lim_{x \rightarrow 2} \frac{x^2 + 2x - 8}{\sqrt{x^2 + 5} - (x+1)}$$

$$(i) \lim_{y \rightarrow 5} \left( \frac{2y^2 + 2y + 4}{6y - 3} \right)^{1/3}$$

$$(j) \lim_{x \rightarrow 0} \sqrt[4]{2 \cos(x) - 5}$$

$$(k) \lim_{x \rightarrow 0} \frac{\frac{1}{3+x} - \frac{1}{3-x}}{x}$$

$$(l) \lim_{x \rightarrow -6} \frac{\frac{2x+8}{x^2-12} - \frac{1}{x}}{x+6}$$

$$(m) \lim_{x \rightarrow \infty} \sqrt{x^2 - 2} - \sqrt{x^2 + 1}$$

$$(n) \lim_{x \rightarrow -\infty} \sqrt{x-2} - \sqrt{x}$$

$$(o) \lim_{x \rightarrow 7} \sqrt[6]{2x - 14}$$

$$(p) \lim_{x \rightarrow 1^-} \sqrt{3 - 3x}$$

$$(q) \lim_{x \rightarrow \infty} \frac{x^4 - 10}{4x^3 + x}$$

$$(r) \lim_{x \rightarrow -\infty} \sqrt[3]{\frac{x-3}{5-x}}$$

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

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

$$(u) \lim_{x \rightarrow -\infty} \cos \left( \frac{x^5 + 1}{x^6 + x^5 + 100} \right)$$

$$(v) \lim_{x \rightarrow 2} \frac{2x}{x^2 - 4}$$

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

$$(x) \lim_{x \rightarrow -1} \frac{x^2 - 25}{x^2 - 4x - 5}$$

$$(y) \lim_{x \rightarrow 3} \frac{\sqrt{x^2 - 5} + 2}{x - 3}$$

$$(z) \lim_{x \rightarrow 0} \frac{2^x + \sin(x)}{x^4}$$

$$(A) \lim_{x \rightarrow 1^-} \frac{1}{x-1} + e^{x^2}$$

$$(B) \lim_{x \rightarrow \infty} 2x^2 - 3x$$

$$(C) \lim_{x \rightarrow 0} \frac{\sqrt{x+2} - \sqrt{2-x}}{x}$$

$$(D) \lim_{x \rightarrow 0^+} \frac{e^x}{1 + \ln(x)}$$

$$(E) \lim_{x \rightarrow \infty} \sqrt{x^2 + 1} - 2x$$

$$(F) \lim_{x \rightarrow 1} \frac{\sqrt[3]{x} - 1}{\sqrt{x} - 1}$$

4. Find the following limits involving absolute values.

$$(a) \lim_{x \rightarrow 1} \frac{x^2 - 1}{|x - 1|}$$

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

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

5. Find the value of the parameter  $k$  to make the following limit exist and be finite. What is then the value of the limit?

$$\lim_{x \rightarrow 5} \frac{x^2 + kx - 20}{x - 5}$$

6. Answer the following questions for the piecewise defined function  $f(x)$  described on the right hand side.

$$(a) f(1) =$$

$$(b) \lim_{x \rightarrow 0} f(x) =$$

$$(c) \lim_{x \rightarrow 1} f(x) =$$

$$f(x) = \begin{cases} \sin(\pi x) & \text{for } x < 1, \\ 2x^2 & \text{for } x > 1. \end{cases}$$

7. Answer the following questions for the piecewise defined function  $f(t)$  described on the right hand side.

$$(a) f(-3/2) =$$

$$(b) f(2) =$$

$$(c) f(3/2) =$$

$$(d) \lim_{t \rightarrow -2} f(t) =$$

$$(e) \lim_{t \rightarrow -1^+} f(t) =$$

$$(f) \lim_{t \rightarrow 2} f(t) =$$

$$(g) \lim_{t \rightarrow 0} f(t) =$$

$$f(t) = \begin{cases} t^2 & \text{for } t < -2 \\ \frac{t + 6}{t^2 - t} & \text{for } -1 < t < 2 \\ 3t - 2 & \text{for } t \geq 2 \end{cases}$$

**ANSWERS:**

1. (a) DNE (b) 0 (c) 3 (d)  $-\infty$  (e) DNE (f) 2 (g) DNE (h) 1

2. (a) 0 (b) DNE (c) 0 (d) DNE (e) 0 (f)  $-\infty$  (g) 1

3.

(a) 5

(b)  $\frac{5}{3}$

(c) 5

(d) 1

(e) 1

(f)  $\frac{1}{24}$

(g)  $\frac{1}{6}$

(h)  $-18$

(i)  $\frac{4}{3}$

(j) DNE

(k)  $-\frac{2}{9}$

(l)  $\frac{1}{36}$

(m) 0

(n) DNE

(o) DNE

(p) 0

(q)  $\infty$

(r)  $-1$

(s)  $-\frac{3}{2}$

(t) 0

(u) 1

(v) DNE

(w)  $-\infty$

(x) DNE

(y) DNE

(z)  $\infty$

(A)  $-\infty$

(B)  $\infty$

(C)  $\frac{1}{\sqrt{2}}$

(D) 0

(E)  $-\infty$

(F)  $\frac{2}{3}$

4. (a) DNE (b)  $\infty$  (c)  $-9$

5.  $k = -1$ , limit is then equal to 9

6. (a) DNE (b) 0 (c) DNE

7. (a) DNE (b) 4 (c) 10 (d) DNE (e)  $\frac{5}{2}$  (f) 4 (g) DNE

8. (a) 0 (b) 0 (c)  $\frac{5}{3}$