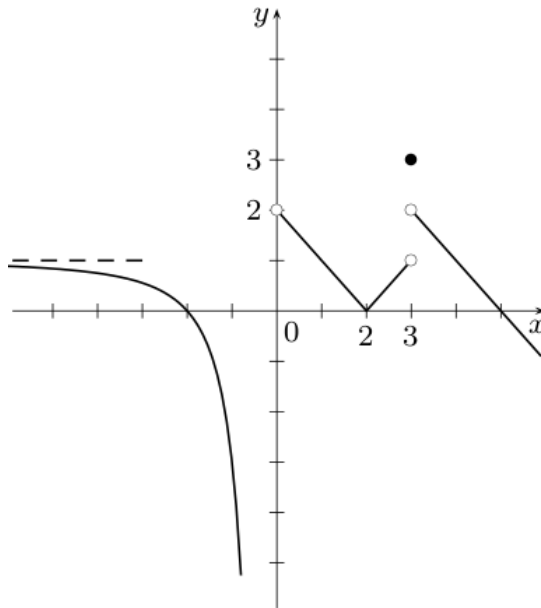


201-103-RE - Calculus 1

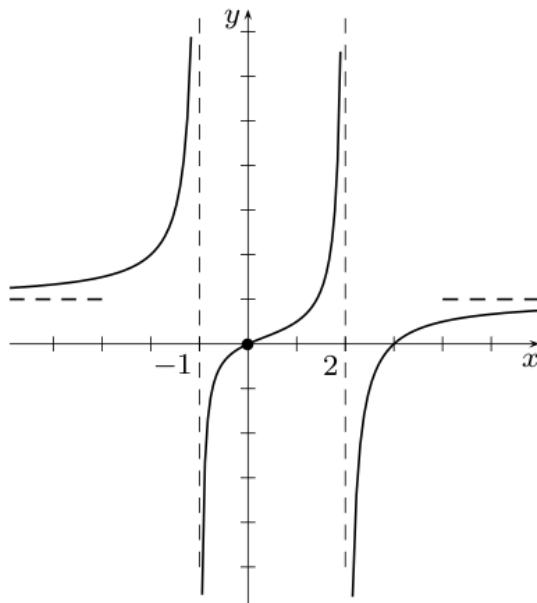
WORKSHEET: LIMITS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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	(l) $\frac{1}{36}$	(w) $-\infty$
(b) $\frac{5}{3}$	(m) 0	(x) DNE
(c) 5	(n) DNE	(y) DNE
(d) 1	(o) DNE	(z) ∞
(e) 1	(p) 0	(A) $-\infty$
(f) $\frac{1}{24}$	(q) ∞	(B) ∞
(g) $\frac{1}{6}$	(r) -1	(C) $\frac{1}{\sqrt{2}}$
(h) -18	(s) $-\frac{3}{2}$	(D) 0
(i) $\frac{4}{3}$	(t) 0	(E) $-\infty$
(j) DNE	(u) 1	(F) $\frac{2}{3}$
(k) $-\frac{2}{9}$	(v) DNE	

4. (a) DNE (b) ∞ (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) $\frac{5}{3}$