

# Practice (after LH/RH)

# KEY

## AB Calculus Section 2.1 Day 2 - Solving Limits Algebraically

Find the limit

1. $\lim_{x \rightarrow -2} x^3 + 6x^2 - 16$ <div style="text-align: center; margin-top: 10px;">0</div>	2. $\lim_{x \rightarrow 0} \pi^2$ <div style="text-align: center; margin-top: 10px;"><math>\pi^2</math></div>	3. $\lim_{x \rightarrow 1} \frac{x^2 + 9}{x^2 - 1}$ <div style="text-align: center; margin-top: 10px;"><math>\frac{5}{3}</math></div>
4. $\lim_{x \rightarrow 4} \frac{x^2 - 16}{x^2 + x - 20}$ <div style="text-align: center; margin-top: 10px;"><math>\frac{8}{9}</math></div>	5. $\lim_{x \rightarrow 0} \frac{x^2 + 2x}{x - 2x^2}$ <div style="text-align: center; margin-top: 10px;"><math>\frac{x(x+2)}{x(1-x)}</math> <math>\frac{2}{1} = 2</math></div>	6. $\lim_{x \rightarrow 1} \frac{1 - x^2}{x^2 + 5x - 6}$ <div style="text-align: center; margin-top: 10px;"><math>-\frac{2}{7}</math></div>
7. $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x^2 - 4x + 3}$ <div style="text-align: center; margin-top: 10px;"><math>-\frac{3}{2}</math></div>	8. $\lim_{x \rightarrow a} \frac{x^2 - a^2}{x - a}$ <div style="text-align: center; margin-top: 10px;"><math>2a</math></div>	9. $\lim_{x \rightarrow 3} \frac{x^3 - 27}{x - 3}$ <div style="text-align: center; margin-top: 10px;"><math>27</math></div>
10. $\lim_{x \rightarrow 1} \frac{x^3 - 3x^2 + 2x}{x - 1}$ <div style="text-align: center; margin-top: 10px;"><math>-1</math></div>	11. $\lim_{h \rightarrow 2} \frac{h^3 - 4h}{h^3 - 2h^2}$ <div style="text-align: center; margin-top: 10px;"><math>2</math></div>	12. $\lim_{x \rightarrow a} \frac{\frac{1}{x} - \frac{1}{a}}{x - a}$ <div style="text-align: center; margin-top: 10px;"><math>-\frac{1}{a^2}</math></div>
13. $\lim_{h \rightarrow 0} \frac{\frac{1}{3+h} - \frac{1}{3}}{h}$ <div style="text-align: center; margin-top: 10px;"><math>-\frac{1}{9}</math></div>	14. $\lim_{x \rightarrow -a} \frac{x^3 + a^3}{x + a}$ <div style="text-align: center; margin-top: 10px;"><math>3a^2</math></div>	15. $\lim_{x \rightarrow 3} \frac{x - 3}{x^3 - 27}$ <div style="text-align: center; margin-top: 10px;"><math>\frac{1}{27}</math></div>
16. $\lim_{x \rightarrow 2} \frac{1 - \frac{4}{x^2}}{1 - \frac{2}{x}}$ <div style="text-align: center; margin-top: 10px;"><math>2</math></div>	17. $\lim_{h \rightarrow 1} \frac{ h-2  - 2}{h}$ <div style="text-align: center; margin-top: 10px;"><math>-1</math></div>	18. $\lim_{x \rightarrow 4} \frac{x - 4}{ x - 4 }$ <div style="text-align: center; margin-top: 10px;"><math>-1</math></div>
19. $\lim_{x \rightarrow 1^+} \frac{x - 1}{ x - 1 }$ <div style="text-align: center; margin-top: 10px;"><math>1</math></div>	20. $\lim_{x \rightarrow 6} 10$ <div style="text-align: center; margin-top: 10px;"><math>10</math></div>	21. $\lim_{x \rightarrow 5} \frac{3x}{ x }$ <div style="text-align: center; margin-top: 10px;"><math>3</math></div>
22. $\lim_{x \rightarrow 10^-} \frac{ x - 10 }{x - 10}$ <div style="text-align: center; margin-top: 10px;"><math>-1</math></div>	23. $\lim_{x \rightarrow 10^+} \frac{ x - 10 }{x - 10}$ <div style="text-align: center; margin-top: 10px;"><math>1</math></div>	24. $\lim_{x \rightarrow 10} \frac{ x - 10 }{x - 10}$ <div style="text-align: center; margin-top: 10px;">DNE</div>
25. $\lim_{x \rightarrow 7} \frac{x^2 - 49}{x - 7}$ <div style="text-align: center; margin-top: 10px;"><math>14</math></div>	26. $\lim_{x \rightarrow 9} \frac{x^2 - 81}{x - 9}$ <div style="text-align: center; margin-top: 10px;"><math>18</math></div>	

27. Find  $\lim_{x \rightarrow 1} f(x)$  where  $f(x) = \begin{cases} \frac{1}{x+2}, & x < 1 \\ 1-2x, & x > 1 \end{cases}$  DNE

28. Find the right hand limit at  $x = 1$  for  $f(x) = \begin{cases} 1-x, & x > 1 \\ 6, & x = 1 \\ 1+x, & x < 1 \end{cases}$  0

29. Find the left hand limit at  $x = 0$  for  $f(x) = \begin{cases} x^3 - 1, & x \geq 0 \\ x + 1, & x < 0 \end{cases}$  1

(14)  
 $(x+a)(x^2 - ax + a^2)$

$(x+a)$   
 $(-a)^2 - a(-a) + a^2$   
 $a^2 + a^2 + a^2$   
 $3a^2$

# KEY

WHAT DID THE COLLEGE FRESHMAN WHO FAILED HIS FIRST CALCULUS TEST HAVE IN COMMON WITH THE COLLEGE FRESHMAN WHO WAS FINED FOR DRIVING 60 MI/HR IN A 30 MI/HR ZONE?

Match each expression with its limit.

1) $\lim_{x \rightarrow 3} x - 1 = 2$	2) $\lim_{x \rightarrow 2} \frac{x-2}{x} = 0$	3) $\lim_{z \rightarrow 1} z^2 + 3z - 2 = 2$
4) $\lim_{z \rightarrow 2^-} \frac{1}{z-2} = -\infty$	5) $\lim_{z \rightarrow 2^+} \frac{1}{z-2} = \infty$	6) $\lim_{z \rightarrow 2} \frac{1}{z-2} = \text{DNE}$
7) $\lim_{x \rightarrow 3} \frac{x^2 - 2x - 3}{x - 3} = 4$	8) $\lim_{x \rightarrow -1} \frac{x^2 - 2x - 3}{x - 3} = 0$	9) $\lim_{t \rightarrow 3}  t - 3  = 0$
10) $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1} = 2$	11) $\lim_{x \rightarrow -1} \frac{x^2 - 1}{x - 1} = 0$	12) $\lim_{x \rightarrow 1} \frac{x - 1}{x^2 - 1} = \frac{1}{2}$
13) $\lim_{x \rightarrow -1} \frac{x - 1}{x^2 - 1} = \text{DNE}$	14) $\lim_{y \rightarrow 5} \frac{y^2 - 2y - 8}{y - 4} = 7$	15) $\lim_{y \rightarrow 4} \frac{y^2 - 2y - 8}{y - 4} = 6$
16) $\lim_{s \rightarrow \infty} \frac{s}{2s + 1} = \frac{1}{2}$	17) $\lim_{s \rightarrow \infty} \frac{2s}{3s + 1} = \frac{2}{3}$	18) $\lim_{s \rightarrow \infty} \frac{s^2}{s + 1} = \infty$
19) $\lim_{s \rightarrow -\infty} \frac{s^2}{s + 1} = -\infty$	20) $\lim_{s \rightarrow -\infty} \frac{s^3}{s + 1} = \infty$	21) $\lim_{y \rightarrow \infty} \frac{2y^2 + y - 5}{4y^2 + 5y + 2} = \frac{1}{2}$
22) $\lim_{x \rightarrow 1} \frac{1 - x}{1 - \sqrt{x}} = 2$	23) $\lim_{x \rightarrow 2} \frac{\frac{1}{x} - \frac{1}{2}}{x - 2} = -\frac{1}{4}$	24) $\lim_{r \rightarrow 4} \frac{\sqrt{r - 3} - 1}{r - 4} = \frac{1}{2}$
25) $\lim_{x \rightarrow 0^-} y = \begin{cases} 2x - 1, & x \leq 0 \\ 1 - 2x, & x > 0 \end{cases}$	26) $\lim_{x \rightarrow 0^+} y = \begin{cases} 2x - 1, & x \leq 0 \\ 1 - 2x, & x > 0 \end{cases}$	27) $\lim_{x \rightarrow 0} y = \begin{cases} 2x - 1, & x \leq 0 \\ 1 - 2x, & x > 0 \end{cases}$

Limits.

DNE

A. -4	<input checked="" type="checkbox"/> D. 4	<input checked="" type="checkbox"/> E. 0	<input checked="" type="checkbox"/> H. $-\infty$	I. $\frac{1}{2}$	K. 6	L. $-\frac{1}{4}$
M. 7	<input checked="" type="checkbox"/> N. none	R. 1	<input checked="" type="checkbox"/> S. $\infty$	<input checked="" type="checkbox"/> T. 2	U. $\frac{2}{3}$	W. -1

NEITHER

STUDENT

KNEW

HIS

LIMITS

# College Freshman WS:

$$1) \lim_{x \rightarrow 3} x-1 = 3-1 = 2$$

$$2) \lim_{x \rightarrow 2} \frac{x-2}{x} = \frac{2-2}{2} = 0$$

$$3) \lim_{z \rightarrow 1} z^2 + 3z - 2 = 1 + 3 - 2 = 2$$

$$4) \lim_{z \rightarrow 2^-} \frac{1}{z-2} \rightarrow \frac{1}{\text{small neg}} = -\infty$$

$$5) \lim_{z \rightarrow 2^+} \frac{1}{z-2} \rightarrow \frac{1}{\text{small pos}} = \infty$$

$$6) \lim_{z \rightarrow 2} \frac{1}{z-2} \rightarrow \text{DNE}$$

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

$$8) \lim_{x \rightarrow -1} \frac{x^2 - 2x - 3}{x-3} = \lim_{x \rightarrow -1} x+1 = 0$$

$$9) \lim_{t \rightarrow 3} |t-3| = 0$$

$$10) \lim_{x \rightarrow 1} \frac{x^2 - 1}{x-1} = \frac{(x+1)(x-1)}{(x-1)} = x+1$$
$$\lim_{x \rightarrow 1} x+1 = 2$$

$$11) \lim_{x \rightarrow -1} \frac{x^2 - 1}{x-1} = \lim_{x \rightarrow -1} x+1 = 0$$

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

$$13) \lim_{x \rightarrow -1} \frac{x-1}{x^2-1} = \lim_{x \rightarrow -1} \frac{1}{x+1} \rightarrow \text{DNE}$$

$$14) \lim_{y \rightarrow 5} \frac{y^2-2y-8}{y-4} = \frac{(y-4)(y+2)}{\cancel{(y-4)}} = y+2$$

$$\lim_{y \rightarrow 5} y+2 = 7$$

$$15) \lim_{y \rightarrow 4} \frac{y^2-2y-8}{y-4} = \lim_{y \rightarrow 4} y+2 = 6$$

$$16) \lim_{s \rightarrow \infty} \frac{s}{2s+1} = \frac{1}{2}$$

$$17) \lim_{s \rightarrow \infty} \frac{2s}{3s+1} = \frac{2}{3}$$

$$18) \lim_{s \rightarrow \infty} \frac{s^2}{s+1} = \infty$$

$$19) \lim_{s \rightarrow -\infty} \frac{s^2}{s+1} = -\infty$$

$$20) \lim_{s \rightarrow -\infty} \frac{s^3}{s+1} = \infty$$

$$21) \lim_{y \rightarrow \infty} \frac{2y^2+y-5}{4y^2+5y+2} = \frac{1}{2}$$

$$22) \lim_{x \rightarrow 1} \frac{1-x}{1-\sqrt{x}} \cdot \frac{1+\sqrt{x}}{1+\sqrt{x}} = \frac{(1-x)(1+\sqrt{x})}{\cancel{(1-x)}} = 1+\sqrt{x}$$

$$\lim_{x \rightarrow 1} 1+\sqrt{x} = 2$$

$$23) \lim_{x \rightarrow 2} \left( \frac{\frac{1}{x} - \frac{1}{2}}{x-2} \right) \frac{2x}{2x}$$

$$\frac{2-x}{2x(x-2)} = \frac{-(x-2)}{2x(x-2)} = \frac{-1}{2x}$$

$$\lim_{x \rightarrow 2} \frac{-1}{2x} = \frac{-1}{4}$$

$$24) \lim_{r \rightarrow 4} \frac{\sqrt{r-3}-1}{r-4} \cdot \frac{\sqrt{r-3}+1}{\sqrt{r-3}+1}$$

$$\frac{\cancel{r-3}-1}{(r-4)(\sqrt{r-3}+1)} = \frac{1}{\sqrt{r-3}+1}$$

$$\lim_{r \rightarrow 4} \frac{1}{\sqrt{r-3}+1} = \frac{1}{2}$$

$$25) 2(0) - 1 = -1$$

$$26) 1 - 2(0) = 1$$

$$27) LH \neq RH \therefore \text{Limit DNE}$$