

AP Calculus Test (1-1) Limits

Name _____

Show work neatly if you have to do any work. CIRCLE your final answer.

Find the following limits, if they exist.

1.
$$\lim_{x \rightarrow -4} \frac{2x + 8}{x^2 + x - 12}$$

2.
$$\lim_{x \rightarrow 2} \frac{5x^3 + 4}{x - 3}$$

3.
$$\lim_{x \rightarrow \pi/6} (\cos(x))$$

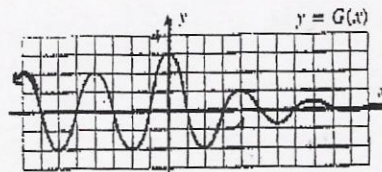
4.
$$\lim_{\theta \rightarrow \pi/4} 2\theta(\csc(\theta))$$

5.
$$\lim_{t \rightarrow \infty} \frac{4t^3 - 5t + 16}{8 - 3t^4}$$

6.
$$\lim_{\theta \rightarrow 3\pi/2} \frac{3\cos^2\theta}{1 + \sin(\theta)}$$

7. Using the graph to the right, find

a) $\lim_{x \rightarrow \infty} g(x)$



b) $\lim_{x \rightarrow -\infty} g(x)$

8. Find $\lim_{x \rightarrow 2} g(x)$ where $g(x) := \begin{cases} 3 - 2x & x \leq 2 \\ x^2 & x > 2 \end{cases}$

9. Using the table below, find $\lim_{x \rightarrow \infty} f(x)$.

x	1	2	4	8	16	32	64	128
f(x)	0.4142	0.4495	0.4721	0.4853	0.4924	0.4962	0.4981	0.499

Use the graph of $g(x)$ to answer questions 10 - 14.

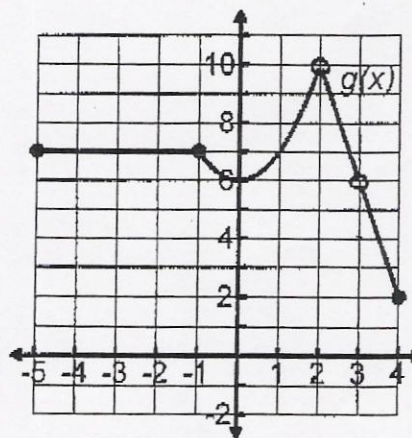
10. $\lim_{x \rightarrow 2} g(x)$

11. $\lim_{x \rightarrow -4} g(x)$

12. $\lim_{x \rightarrow 4} g(x)$

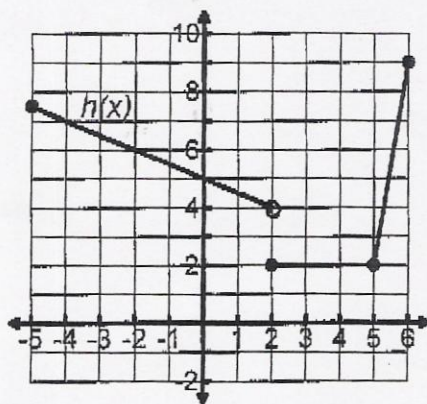
13. Find $g(3)$

14. $\lim_{x \rightarrow -5^+} g(x)$



15. 15. If $s(t) = -t^2 + 7$, then $\lim_{t \rightarrow 0} \frac{s(t) - s(0)}{t^2}$

16. For $h(x)$ in the graph to the right,
 a) Write the function for $h(x)$.



b) $\lim_{x \rightarrow 2^-} h(x)$

17. State whether $G(x)$ is continuous or not and justify your answer with calculus!

$$G(x) := \begin{cases} x - 7 & x < -2 \\ -x^2 & x > -2 \end{cases}$$

18. Circle all of the following functions that are continuous everywhere.

I. $y = x^3$

II. $y = \sec(x)$

III. $y = \frac{1}{x}$

IV. $y = e^x$

19. Find a value or values for k such that $v(t)$ is continuous.

$$V(t) := \begin{cases} k^2 - kt + 1 & t < 2 \\ t^2 + kt + 2 & t \geq 2 \end{cases}$$

20. For $f(x) = \frac{x^2 - 2x - 3}{x^2 - x - 2}$, state the

a) horizontal asymptotes

b) vertical asymptotes.

AP Calculus Test (1-1) Limits

Name Key

Show work neatly if you have to do any work. CIRCLE your final answer.

Find the following limits, if they exist.

$$1. \lim_{x \rightarrow -4} \frac{2x+8}{x^2+x-12} = \lim_{x \rightarrow -4} \frac{2(x+4)}{(x+4)(x-3)} = \frac{-2}{7}$$

$$2. \lim_{x \rightarrow 2} \frac{5x^3+4}{x-3} = \frac{44}{-1} = -44$$

$$3. \lim_{x \rightarrow \pi/6} (\cos(x))$$

$$\frac{\sqrt{3}}{2}$$

$$4. \lim_{\theta \rightarrow \pi/4} 2\theta(\csc(\theta))$$

$$= 2\left(\frac{\pi}{4}\right)\frac{2}{\sqrt{2}} = \frac{\pi}{\sqrt{2}}$$

$$5. \lim_{t \rightarrow \infty} \frac{4t^3 - 5t + 16}{8 - 3t^4}$$

$$= 0$$

$$6. \lim_{\theta \rightarrow 3\pi/2} \frac{3\cos^2\theta}{1+\sin(\theta)}$$

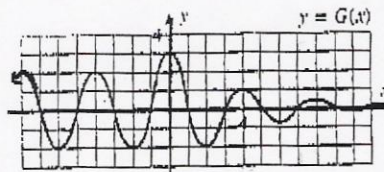
$$= \lim_{\theta \rightarrow \frac{3\pi}{2}} \frac{3(1-\sin^2\theta)}{1+\sin\theta} = \lim_{\theta \rightarrow \frac{3\pi}{2}} \frac{3(1-\sin\theta)(1+\sin\theta)}{1+\sin\theta}$$

$$3(1+1) = 6$$

7. Using the graph to the right, find

a) $\lim_{x \rightarrow \infty} g(x) = 0$

b) $\lim_{x \rightarrow -\infty} g(x) = \text{DNE}$



8. Find $\lim_{x \rightarrow 2} g(x)$ where $g(x) := \begin{cases} 3 - 2x & x \leq 2 \\ x^2 & x > 2 \end{cases}$

DNE

9. Using the table below, find $\lim_{x \rightarrow \infty} f(x)$. $.5$

x	1	2	4	8	16	32	64	128
f(x)	0.4142	0.4495	0.4721	0.4853	0.4924	0.4962	0.4981	0.499

Use the graph of $g(x)$ to answer questions 10 - 14.

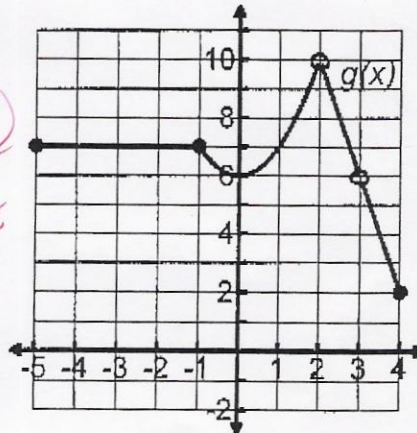
10. $\lim_{x \rightarrow 2} g(x) = 10$

11. $\lim_{x \rightarrow -4} g(x) = 7$

12. $\lim_{x \rightarrow 4} g(x) = \text{DNE}$

13. Find $g(3)$ DNE

14. $\lim_{x \rightarrow -5^+} g(x) = 7$



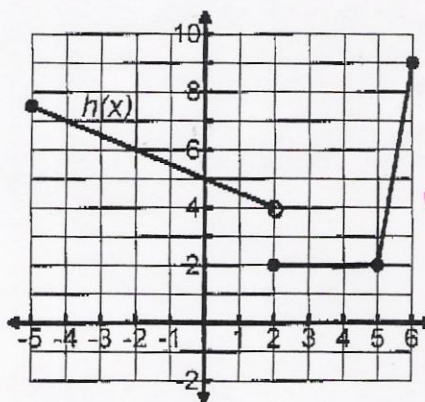
15. 15. If $s(t) = -t^2 + 7$, then $\lim_{t \rightarrow 0} \frac{s(t) - s(0)}{t^2} = \lim_{t \rightarrow 0} \frac{-t^2 + 7 - 7}{t^2} = \lim_{t \rightarrow 0} \frac{-t^2}{t^2} = -1$

16. For $h(x)$ in the graph to the right,

a) Write the function for $h(x)$.

4 pts

$$h(x) = \begin{cases} -\frac{1}{2}x + 5, & -5 \leq x < 2 \\ 2, & 2 \leq x \leq 5 \\ 7(x-5) + 2, & 5 < x < 6 \end{cases}$$



$y - 2 = 7(x - 5)$

1 pt

b) $\lim_{x \rightarrow 2^-} h(x) = 4$

17. State whether $G(x)$ is continuous or not and justify your answer with calculus!

$$G(x) = \begin{cases} x - 7 & x < -2 \\ -x^2 & x > -2 \end{cases}$$

$G(-2)$ is not defined so
 $G(x)$ is not continuous

18. Circle all of the following functions that are continuous everywhere.

I. $y = x^3$

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III. $y = \frac{1}{x}$

IV. $y = e^x$

19. Find a value or values for k such that $v(t)$ is continuous.

$$v(t) = \begin{cases} k^2 - kt + 1 & t < 2 \\ t^2 + kt + 2 & t \geq 2 \end{cases}$$

$k = -1$ or 5

$$k^2 - 2k + 1 = 4 + 2k + 2$$

$$k^2 - 4k - 5 = 0$$

$$(k - 5)(k + 1) = 0$$

20. For $f(x) = \frac{x^2 - 2x - 3}{x^2 - x - 2}$, state the

$$f(x) = \frac{(x-3)(x+1)}{(x-2)(x+1)}$$

a) horizontal asymptotes

$y = 1$

b) vertical asymptotes.

$x = 2$