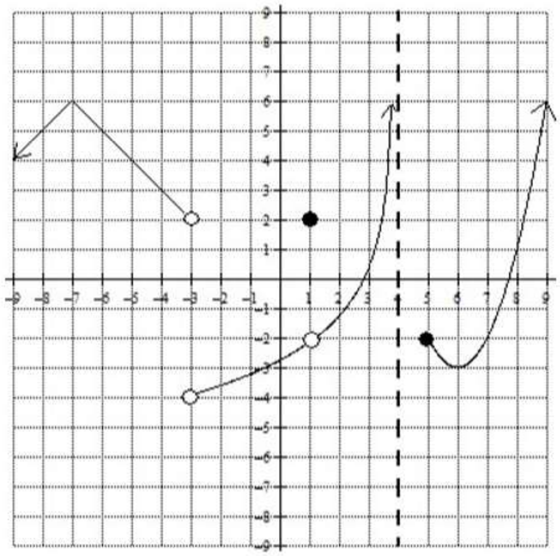
AP Calculus
Extra Practice on Limits and Multiple Choice Practice

For questions 1 – 5, refer to the graph of $f(x)$ to the right. Find the value of each indicated limit. If a limit does not exist, give a reason.

1.	$\lim_{x\to -3^+} f(x) + \lim_{x\to 5^+} 3f(x)$	
2.	$\lim_{x\to 1}\left[\frac{1}{2}f(x)+\cos(\pi x)\right]$	
3.	$\lim_{x\to 4^-} f(x)$	
4.	$\lim_{x\to -\infty} f(x)$	
5.	$\lim_{x\to -3} f(x)$	



For questions 6 – 11, find the value of each limit analytically. If a limit does not exist, state why.

6. $\lim_{x\to 0}\frac{x^3-2x^2+3x}{x}$

7. $\lim_{x\to 0}\frac{3\tan x}{x\sec x}$

8. $\lim_{x\to 3^+}\frac{x^2-4}{x^2-x-6}$

9. $\lim_{x\to 2^-}\ln(-x+2)$

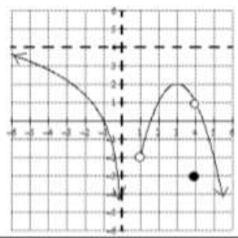
10. $\lim_{x\to\infty}\frac{x^3-2x^2+3x}{x^2-3x^3}$

11. $\lim_{x\to\infty} 5+\frac{5}{x}$

For question 12 – 16, use the equation $g(x)$ below and the graph of the function $f(x)$.

$$g(x) = \begin{cases} 3|x+3|, & x < -2 \\ \cos\left(\frac{\pi x}{2}\right), & -2 \le x < 2 \\ ax^2 + 2x, & x \ge 2 \end{cases}$$

Graph of $f(x)$



12. Is $g(x)$ continuous at $x = -2$. [Base your response on the three part definition of continuity.]

13. For what value(s) of a is $g(x)$ continuous at $x = 2$?

14. For what value(s) of b is the function $f(x)$ discontinuous? At which of these values does $\lim_{x\to b} f(x)$ exist? Explain your reasoning.

15. Find $\lim_{x\to 2^+} [g(x) + 2f(x)]$.

16. Which of the following limits do(es) not exist? Give a reason for your answers.

$\lim_{x\to 1} f(x)$	$\lim_{x\to 4} f(x)$	$\lim_{x\to 0^-} f(x)$

17. Find the values of k and m so that the function below is continuous on the interval $(-\infty,\infty)$.

$$f(x)=\begin{cases} x^2-kx+3, & x<-2 \\ 2x-3, & -2\le x\le 3 \\ 3-2m, & x>3 \end{cases}$$

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18. $\lim\limits_{x\to 0}\dfrac{4x-3}{7x+1}=$

A. ∞ B. $-\infty$ C. 0 D. $\frac{4}{7}$ E. -3

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19. $\lim\limits_{x\to \frac{1}{3}}\dfrac{9x^2-1}{3x-1}=$

A. ∞ B. $-\infty$ C. 0 D. 2 E. 3

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20. $\lim\limits_{x\to 2}\dfrac{x^3-8}{x^2-4}=$

A. 4 B. 0 C. 1 D. 3 E. 2

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21. The function $G(x)=\begin{cases} x-3, & x>2 \\ -5, & x=2 \\ 3x-7, & x<2 \end{cases}$ is not continuous at $x=2$ because…

A. $G(2)$ is not defined B. $\lim\limits_{x\to 2} G(x)$ does not exist C. $\lim\limits_{x\to 2} G(x)\ne G(2)$

D. Only reasons B and C E. All of the above reasons.

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22. $\lim\limits_{x\to \infty}\dfrac{-3x^2+7x^3+2}{2x^3-3x^2+5}=$

A. ∞ B. $-\infty$ C. 1 D. $\frac{7}{2}$ E. $-\frac{3}{2}$

23. $\lim_{x \to -2} \frac{\sqrt{2x+5}-1}{x+2} =$

A. 1 B. 0 C. ∞ D. $-\infty$ E. Does Not Exist

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24. If $f(x) = 3x^2 - 5x$, then find $\lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$.

A. $3x - 5$
B. $6x - 5$
C. $6x$
D. 0
E. Does not exist

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25. $\lim_{x \to -\infty} \frac{2-5x}{\sqrt{x^2+2}} =$

A. 5 B. –5 C. 0 D. $-\infty$ E. ∞

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26. The function $f(x) = \frac{2x^2+x-3}{x^2+4x-5}$ has a vertical asymptote at $x = -5$ because…

A. $\lim_{x \to -5^+} f(x) = \infty$
B. $\lim_{x \to -5^-} f(x) = -\infty$
C. $\lim_{x \to -5^-} f(x) = \infty$
D. $\lim_{x \to \infty} f(x) = -5$
E. $f(x)$ does not have a vertical asymptote at $x = -5$

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27. Consider the function $H(x) = \begin{cases} 3x-5, & x < 3 \\ x^2 - 2x, & x \geq 3 \end{cases}$. Which of the following statements is/are true?

I. $\lim_{x \to 3^-} H(x) = 4$. II. $\lim_{x \to 3} H(x)$ exists. III. $H(x)$ is continuous at $x = 3$.

A. I only B. II only C. I and II only
D. I, II and III E. None of these statements is true