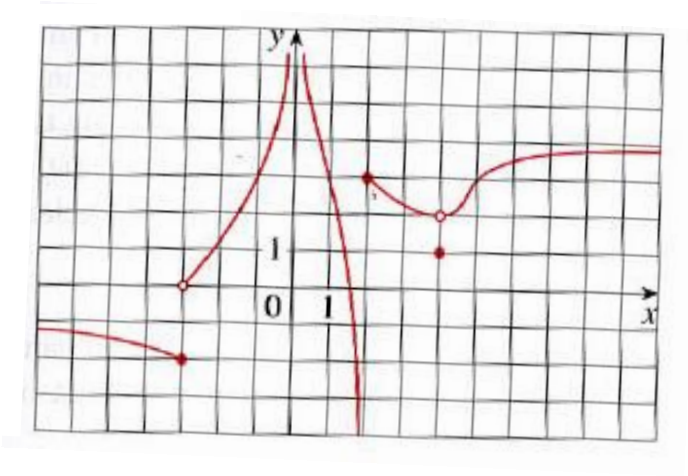
AP Calculus-AB

Name_____

Review: Limits, Continuity, & R.O.C

Day 12



1. The graph of f is given to the left.

A. Find each limit, or explain why it does not exist.

$\lim_{x\to 2^+} f(x)$ $\lim_{x\to -3^+} f(x)$

$\lim_{x\to -3} f(x)$ $\lim_{x\to 4} f(x)$

$\lim_{x\to 0} f(x)$ $\lim_{x\to 2^-} f(x)$

$\lim_{x\to \infty} f(x)$ $\lim_{x\to -\infty} f(x)$

B. State the equations of the horizontal asymptotes.

C. State the equations of the vertical asymptotes.

D. At what numbers is f discontinuous? Explain.

2. Sketch the graph of an example of a function f that satisfies all of the following conditions;

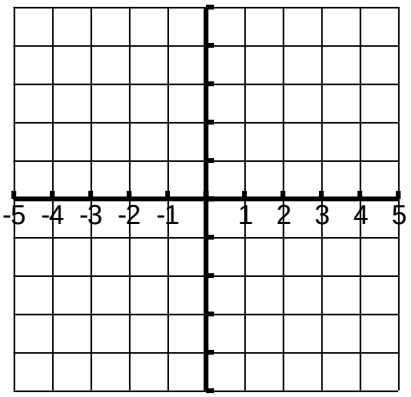
$\lim_{x\to -\infty} f(x) = -2$

$\lim_{x\to \infty} f(x) = 0$

$\lim_{x\to -3} f(x) = \infty$

$\lim_{x\to -3^-} f(x) = -\infty$

$\lim_{x\to -3^+} f(x) = 2$



Find the limit:

3. $\lim_{x\to 1} e^{x^2-x}$

4. $\lim_{x\to 3} \frac{x^2-9}{x^2+2x-3}$

5. $\lim_{x\to -3} \frac{x^2-9}{x^2+2x-3}$

6. $\lim_{x\to 1^+} \frac{x^2-9}{x^2+2x-3}$

7. $\lim_{h\to 0} \frac{(h-1)^2+1}{h}$

8. $\lim_{t\to 2} \frac{t^2-4}{t^3-8}$

9. $\lim_{R\to 9} \frac{\sqrt{R}}{(R-9)^4}$

10. $\lim_{x\to \infty} \frac{1-2x^2-x^4}{5+x-3x^4}$

11. $\lim_{w\to 0} \frac{\frac{1}{6+w}-\frac{1}{6}}{w}$

12. $\lim_{\theta\to 0} \frac{\sin 4\theta}{\theta}$

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Find the limit:

13. $\lim_{x\to-\infty}\dfrac{x-2}{\sqrt{3x^2+1}}$

14. $\lim_{t\to\infty}\dfrac{x^2-6}{1+x}$

15. $\lim_{v\to0^+}\dfrac{6-v^2}{v^3-v}$

16. $\lim_{x\to\infty}\dfrac{x^2+2x-3}{x^3+2x^2}$

17. $\lim_{x\to\frac{\pi}{6}} tanx$

18. $\lim_{x\to\frac{\pi}{2}^+} tanx$

19. $\lim_{x\to1}\cos\pi x$

20. $\lim_{x\to0}\dfrac{\sqrt{3+x}-\sqrt{3}}{x}$

x	–1.1	–1.003	–1.0001	–0.9999	–0.8762	–0.6522
h(x)	-89	-677	-5009	-5.003	-5.088	-5.113
p(x)	9.222	9.111	9.002	8.999	8.802	8.777
r(x)	–99	–999	–9999	–8853	–871	–86

21.

$\lim_{x\to-1^+} h(x) =$ $\lim_{x\to-1} p(x) =$

$\lim_{x\to-1^-} h(x) =$ $\lim_{x\to-1} r(x) =$

$\lim_{x\to-1} h(x) =$

22. $f(x)=\begin{cases}\sqrt{-x} & if \quad x<0\\ 3-x & if \quad 0\le x\le 3\\ (x-3)^2 & if \quad x>3\end{cases}$

Evaluate each limit, if it exists.

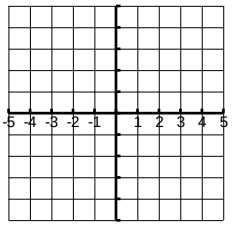
A. $\lim_{x\to0^+} f(x) =$ D. $\lim_{x\to3^+} f(x) =$

B. $\lim_{x\to0^-} f(x) =$ E. $\lim_{x\to3^-} f(x) =$

C. $\lim_{x\to0} f(x) =$ F. $\lim_{x\to3} f(x) =$

G. Where is f discontinuous? Justify your answer.

H. Sketch $f(x)$



23. Use the Intermediate Value Theorem to show that there is a root of the equation $f(x)=x^5-x^3+3x-5$ on the interval $(1,2)$.

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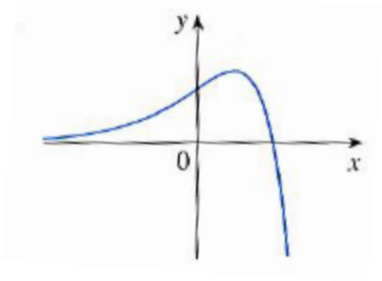
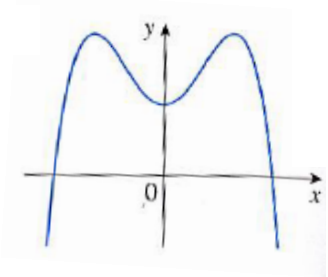
Sketch the graph of $f'(x)$ directly onto the graph of $f(x)$.

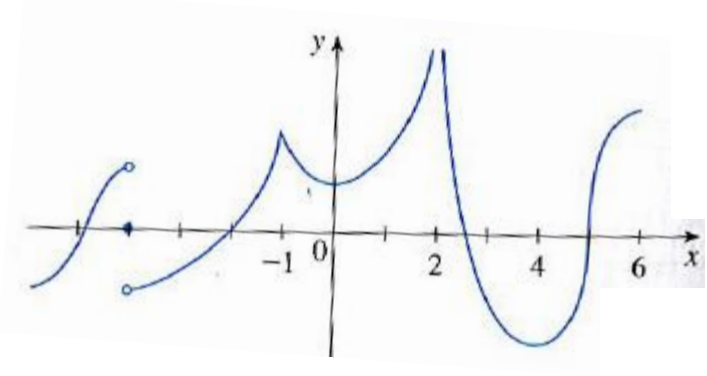
24.



25.



26. The graph of f is shown. State, with reasons, the numbers at which f is not differentiable.



27. Let T(t) be the temperature (in $^{\circ}F$) in Phoenix t hours after midnight on September 10, 2008. The table shows values of the function recorded every two hours.

t	0	2	4	6	8	10	12	14
T	82	75	74	75	84	90	93	94

What is the meaning of T'(8)? Estimate its value.

28. The cost of producing x ounces of gold from a new gold mine is C=f(x) dollars.

a.) What is the meaning of the derivative f'(x)? What are its units?

b.) What does the statement f'(800)=17 mean?

c.) Do you think the values of f'(x) will increase or decrease in the short term? What about the long term? Explain.

Use the given table to approximate the expressions to the right.

x	-2	-1	0	1	2
$f(x)$	-4	0	2	9	10
$g(x)$	30	16	8	1	.5

29. $f'(0) =$

30. $2g'(-1) + f'(2) =$

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31. If f is continuous on $[2,6]$, with $f(2) = 20$ and $f(6) = 10$, then the Intermediate Value Theorem says which of the following is true?

I. $f(x) = 25$ does not have a solution on $[2,6]$.
II. $f(x) = 17$ has a solution on $[2,6]$.
III. $f(x) = 0$ has a solution on $[2,6]$.

(A) I only
(B) II only
(C) III only
(D) I and II only
(E) I, II, and III

32. Using the table of values of $f(x)$, the average rate of change of f on the interval $[-2,4]$ is

x	-6	-4	-2	0	2	4	6
$f(x)$	9	3	1	5	8	15	31

(A) $\frac{1}{6}$
(B) 1
(C) $\frac{3}{2}$
(D) $\frac{7}{3}$
(E) 12

33. $\lim_{x\to\infty} \frac{3x+2}{\sqrt{x^2+4}}$ is

(A) $-\infty$
(B) -3
(C) 0
(D) 3
(E) ∞

34. $\lim_{x\to 1} \frac{x^2+2x-3}{x^2-1} =$

(A) -2
(B) -1
(C) 10
(D) 1
(E) 2

35. $\lim_{h\to 25} \frac{\sqrt{h}-5}{h-25}$ is

(A) 0
(B) $\frac{1}{25}$
(C) $\frac{1}{10}$
(D) $\frac{1}{5}$
(E) nonexistent

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

(A) 0
(B) $\frac{1}{24}$
(C) $\frac{3}{4}$
(D) ∞
(E) $-\infty$

37. Let $f(x) = \begin{cases} \frac{x^2-9}{x-3}, & x \neq 3 \\ 6, & x = 3 \end{cases}$.

Which of the following is true?

I. $\lim_{x\to 3} f(x)$ does not exist.
II. f is continuous at $x = 3$.
III. The line $x = 3$ is a vertical asymptote

(A) I only
(B) II only
(C) III only
(D) I and II only
(E) I and III only

38. What is $\lim_{x\to 1} \frac{\sqrt{x}-1}{x-1}$?

(A) 0
(B) $\frac{1}{2}$
(C) 1
(D) $\frac{3}{2}$
(E) nonexistent

39. What is $\lim_{x\to\infty} \frac{x^2-6}{2+x-3x^2}$

(A) -3 (B) $-\frac{1}{3}$ (C) $\frac{1}{3}$ (D) 2 (E) *the limit does not exist*

40. The function f is continuous at $x=1$. If $f(x) = \begin{cases} \frac{\sqrt{x+3}-\sqrt{3x+1}}{x-1} & \text{for } x \neq 1 \\ k & \text{for } x = 1 \end{cases}$ then $k =$

(A) 0 (B) 1 (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$ (E) *none of the above*