AP Calculus AB
Chapter 3.1-3.6 Review
Mrs. Schempp

Name ________________________________
Period _______ Date __________________

For #1-13: Differentiate. No need to simplify. :)

1. $f(x) = 5\sqrt[3]{x^2} - 6x^5 + \frac{1}{x^2}$	2. $y = (5x^2 - 2x - 3)(3x^2 - x)$
3. $h(x) = 2x^{-4} - 3x^{-3} + \frac{5}{2}x^{-2} - x^{-1}$	4. $g(x) = (3x^4 + x)(x^5 - 1)^2$
5. $H(x) = \frac{x^2 + x - 2}{x^3 + 6}$	6. $y = \frac{3x^2 - 7x}{\sqrt{x}}$
7. $f(x) = \frac{\tan x}{1 + \cos x}$	8. $y = \csc(x^{-2})$
9. $H(x) = \sqrt[3]{(6x^2 - x)} + 2x^2$	10. $g(x) = \sin^2(3x)$
11. $y = \sin x + \frac{1}{2}\cot x$	12. $f(x) = x^3 \cot x$

13. $y=\sqrt{\dfrac{x-1}{x+1}}$

14. Find the first and second derivative of $f(x)=\dfrac{1}{2}x^5-2x^{-3}+9x$

15. Use the **definition** of the derivative to differentiate $f(x)=x^2-12x$

16. Write the equations of the tangent and normal lines to the graph of $f(x)=3x^2-17x+30$ at x = -3.

17. Write the equations of the tangent and normal lines to the graph of $f(x)=\dfrac{2}{3x+1}$ at x = 1.

18. Find all horizontal tangents of the curve $f(x)=3x^3-12x^2$.

19. **Graphical, Numerical, Algebraic, Verbal!**
Let *f* and *g* be differentiable functions with the values for *f*, *g*, *f'*, and *g'* at x = 2 and x = 3 be given in the table below:

x	*f*(x)	*g*(x)	*f* '(x)	*g*'(x)
2	7	3	π	5
3	2	-4	-1	8

a. if $h(x)=f(x)+g(x)$ find $h'(3)$

b. if $h(x)=f(x)-g(x)$ find $h'(2)$

c. if $h(x)=f(x)\cdot g(x)$ find $h'(3)$

d. if $h(x)=\dfrac{f(x)}{g(x)}$ find $h'(2)$

e. if $h(x)=f(g(x))$ find $h'(2)$

f. if $h(x)=g(f(x))$ find $h'(3)$

g. if $h(x)=\left[f(x)\right]^3$ find $h'(2)$

h. if $h(x)=2\left[g(x)\right]^5$ find $h'(3)$

20. Consider the function $f(x)=\begin{cases} x^3-1 & x\geq 3 \\ 27x+1 & x<3 \end{cases}$

a. is f(x) continuous at x=3? why or why not?

b. is f(x) differentiable at x=3? why or why not?

21. Consider the function $f(x)=\begin{cases} 2x^2+5 & x\geq 0 \\ 6x+5 & x<0 \end{cases}$

a. is f(x) continuous at x=0? why or why not?

b. is f(x) differentiable at x=0? why or why not?

22. A particle moves along a line so that its position at any time $t \geq 0$ is given by the function $s(t)=t^2-2t-3$, where s is measured in feet and t is measured in seconds.

a. What is the velocity function of the particle?

b. What is the acceleration function of the particle?

c. Find the average velocity of the particle during the first 5 seconds.

d. Find the position of the particle when t=5.

e. Find the instantaneous velocity when t = 5.

f. Find the acceleration of the particle when t = 5.

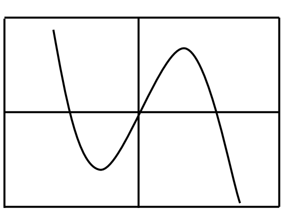
g. Is the particle slowing down or speeding up at t=5? Explain.

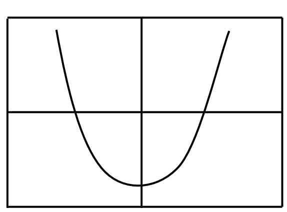
h. Where does the particle change direction?

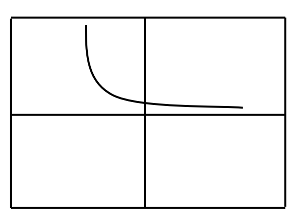
i. What is the furthest left that the particle ever gets?

j. What is the furthest right that the particle ever gets?

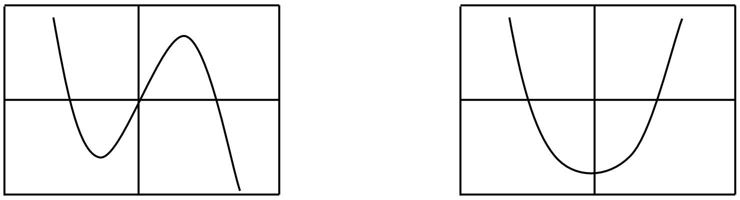
23. The graph of a function f is shown. Sketch the graph of the derivative of f.







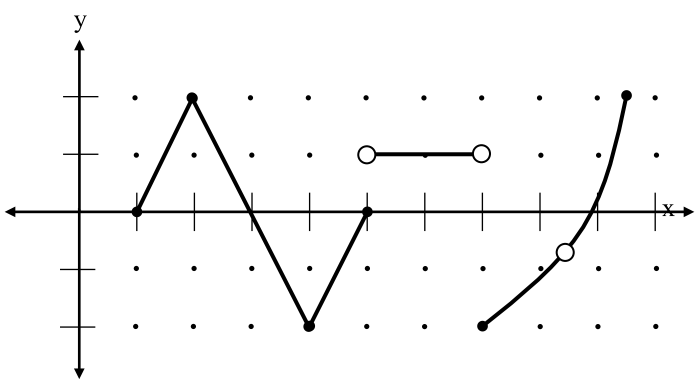
24. The graph of the derivative function f' is shown. Sketch the graph of a possible graph of f.



25. A function is continuous and $f(2)=0$. Sketch the graph of $f(x)$ if:

$$f'(x) = \begin{cases} -3 & x > 0 \\ 0 & x < 0 \end{cases}$$

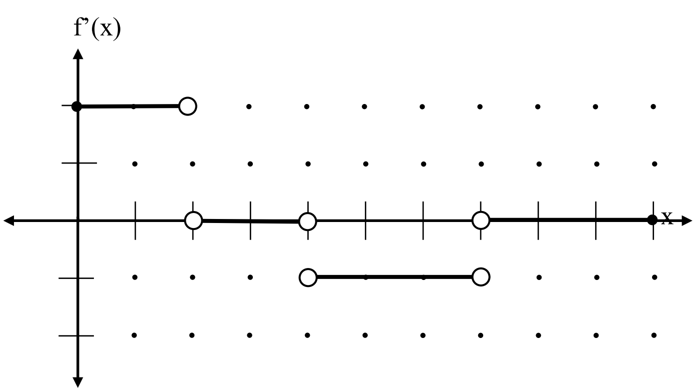
26. The graph of a function is given below. At what domain points does the function appear to be (a) differentiable (b) continuous, but not differentiable (c) neither continuous nor differentiable?



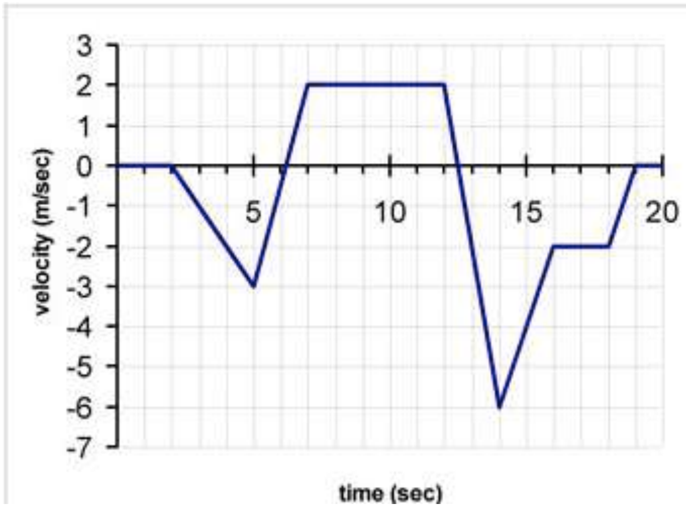
27. Find all the values of x for which the function is differentiable:

a. $f(x) = \sin x$ b. $f(x) = \frac{x+1}{x-3}$ c. $f(x) = \sqrt{3x-5}$ d. $f(x) = [x-1]$

28. The graph of the derivative of a continuous function is given. If f(0) = -1, sketch a possible graph for f(x).



29. The graph below shows the velocity of a particle moving along a straight line.



a. On what interval(s) is the particle moving left?

b. On what interval(s) is the particle moving right?

c. On what interval(s) is the particle speeding up?

d. On what interval(s) is the particle slowing down?

e. At what time is the particle changing direction? Also known as ____________.

f. What is the particles speed at *t = 16 seconds?*

g. When is the acceleration zero?

30. a. $\lim_{h\to 0}\frac{2(3+h)^2-18}{h}=$

b. $\lim_{h\to 0}\frac{2(x+h)^2-2x^2}{h}=$? when x = 3

c. If $f(x) = 2x^2$, then evaluate:

$$\lim_{h\to 0}\frac{f(3+h)-f(3)}{h}$$