REVIEW – DERIVATIVES
Calculus AB

Use the **BEST** method to find the derivative of each.

1. $g(x)=\dfrac{-2(2x^3+6x^2+2x)}{4x^2}$
2. $h(x)=x^3\csc x$
3. $f(x)=x^2(3x+4)^5$
4. $f(x)=\sec^3 4x$
5. $i(x)=x\sqrt[3]{x}$
6. $y=\dfrac{(x-3)^3}{(4x+5)^2}$
7. $y=(3x-1)^3\sqrt{2x-1}$
8. $y=2\sin x\cdot\cos x$
9. $j(x)=-4\sin x+4x\cos x$
10. $y=\dfrac{\cos x}{x\sin x}$ (HINT: change this before you start!

11. Use the definition of the derivative to find $f'(x)$ for each function. SHOW ALL STEPS.
    a. $f(x)=2x^2-3$
    b. $f(x)=\dfrac{1}{2x-3}$
12. Name all of the ways that you could be asked to find the derivative of a function.
13. Use the quotient rule to show $\dfrac{d[\tan x]}{dx}=\sec^2 x$.

Find the derivative at the given point.

14. $f(x)=\tan x$, $\left(\dfrac{\pi}{4},1\right)$
15. $f(x)=2-\sqrt[5]{x^2}$, $(32,-2)$

16. Find $g'(4)$, given that $f(4)=3$, $f'(4)=-5$ and $g(x)=\dfrac{f(x)-3}{x^2}$.

17. Find $g'(3)$, given that $f(3)=-2$, $f'(3)=4$ and $g(x)=3x^2-5f(x)$.

18. Find $f'''(2)$ where $f(x)=3x^2-2$

19. Find $f'(c)$ for $f(x)=x\sqrt[3]{x}$ and $c=-8$.

20. Find $g'(-2)$ for $g(x)=2x^3-2x^2-3$

21. Find the equation of the tangent line that to the graph of $g(x)=2x^2+4x+3$ and is parallel to the line $4x-3y=3$.

Find the equation of the tangent line at the given value of x.

22. $y=\dfrac{2x-3}{3x-2}$ at x = 2.
23. $y=x\cos 2x$ at $x=\dfrac{\pi}{2}$
24. $y=\tan x$ where $x=\dfrac{\pi}{4}$
25. Use the chart to estimate $f'(12)$.
    (Hint: what is the derivative?)

x	12	12.5	13	13.5	14	14.5
f(x)	8.92	8.52	8.12	7.32	6.21	4.92

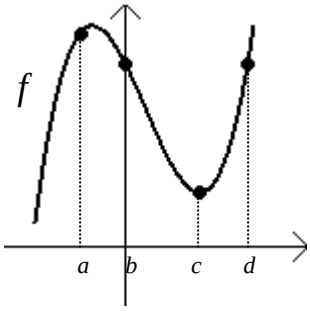
Find the x-value of the horizontal tangents to the given function f(x)

26. $f(x)=\dfrac{x^2}{x-1}$
27. $f(x)=x^2-6x+4$

Find a and b so that f(x) is both continuous and differentiable.

28. $f(x)=\begin{cases} ax^3+bx^2; x\le 1 \\ ax+2; x>1 \end{cases}$

29. Find the equation of the tangent line for $f(t)=\dfrac{\sec t}{t}$ at $x=\pi$.



Use the figure at the right to answer each.

30. Put $f'(a)$, $f'(b)$, $f'(c)$ and $f'(d)$ in order from least to greatest.

31. What is meant by $\dfrac{f(c)-f(a)}{c-a}$?

32. Which is the smallest? $\dfrac{f(c)-f(a)}{c-a}, f'(c), \dfrac{f(c)-f(d)}{c-d}, f'(b)$

Multiple Choice

1. If $f(x)=\pi^3$, then $f'(2)=$
   a. 2π
   b. 0
   c. π
   d. 1
   e. π^2

2. Find the equation of the tangent line to the graph of $y=\sin x$ for $0\le x<\pi$ at the point where $\dfrac{dy}{dx}=\dfrac{1}{2}$.
   a. $y+\dfrac{\sqrt{3}}{2}=\dfrac{1}{2}\left(x-\dfrac{\pi}{3}\right)$
   b. $y-\dfrac{\sqrt{3}}{2}=\dfrac{1}{2}\left(x-\dfrac{\pi}{3}\right)$
   c. $y-\dfrac{\pi}{3}=\dfrac{1}{2}\left(x-\dfrac{1}{2}\right)$
   d. $y+\dfrac{\pi}{3}=\dfrac{1}{2}\left(x-\dfrac{1}{2}\right)$

3. If $g(x)=\dfrac{-x-f(x)}{f(x)}$, $f(1)=4$ and $f'(1)=2$, then $g'(1)=$
   a. -1/2
   b. 11/8
   c. 3/16
   d. 1/8
   e. -1/8

4. If $f(x)=\begin{cases} x^3+x+a;\ x\le 1 \\ 2bx-1;\ x>1 \end{cases}$ is continuous and differentiable, find the value of $a+2b$.
   a. 2
   b. 4
   c. 3
   d. 5
   e. 0

5. If $f(x)=5\cos^2(\pi-x)$, then $f'\left(\dfrac{\pi}{4}\right)$ is
   a. 0
   b. 5
   c. -5
   d. -10
   e. -2

Answers

1. $-1+\frac{1}{x^2}$
2. $x^2\csc x(3-x\cot x)$
3. $x(3x+4)^4(21x+8)$
4. $12(\sec 4x)^3\tan 4x$
5. $\frac{4}{3}x^{\frac{1}{3}}$
6. $\frac{(x-3)^2(4x+39)}{(4x+5)^3}$
7. $\frac{(3x-1)^2(21x-10)}{\sqrt{2x-1}}$
8. $-2\sin^2 x+2\cos^2 x$
9. $-4x\sin x$
10. $\frac{-x\csc^2 x-\cot x}{x^2}$
11. 4x $\frac{-2}{(2x-3)^2}$
12. instantaneous rate of change
    instantaneous slope
    $f'(x)$
    slope of tangent line
    dy/dx
13. see your notes!
14. 2
15. -1/20
16. -5/16
17. -2
18. 0
19. -8/3
20. 32
21. $y-11/9=4/3(x+2/3)$
22. $y-\frac{1}{4}=\frac{5}{16}(x-2)$
23. $y+\frac{\pi}{2}=-1\left(x-\frac{\pi}{2}\right)$
24. $y-1=2\left(x-\frac{\pi}{4}\right)$
25. $\frac{f(12.5)-f(12)}{12.5-12}=-0.8$
26. 0,2
27. 3
28. a=-2, b=2
29. $y+\frac{1}{\pi}=\frac{1}{\pi^2}(x-\pi)$
30. $f'(b), f'(c), f'(a), f'(d)$
31. It is the slope of the secant line between the points, (a, f(a)) and (c, f(c)).
32. $f'(b)$

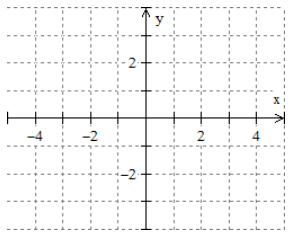
Multiple Choice

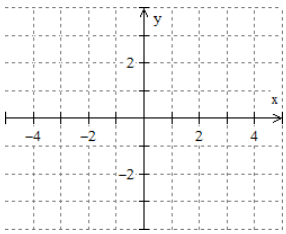
1. B
2. B
3. E
4. D
5. C

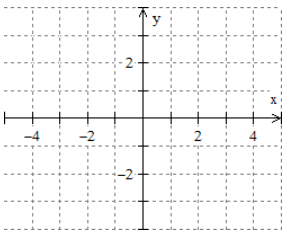
IN CLASS SUPER FAST REVIEW

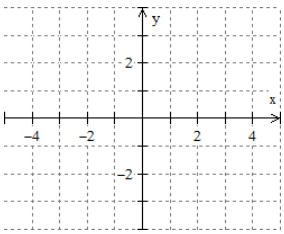
ULTRA QUICK DERIVATIVES		
$a(x)=\cos 5x$	$b(x)=\csc 3x$	$c(x)=\sin^3(7x)$
$d(x)=\dfrac{2}{\sqrt{4-x}}$	$e(x)=x\sqrt{x}$	$f(x)=\dfrac{2x-6x^5}{x^2}$
$g(x)=\dfrac{2x-1}{3x-5}$	$h(x)=x\sin(4x)$	

Given the graph of $f(x)$, graph $f'(x)$









Use the graph to find each.

1. $h'(1)$ for $h(x)=f(x)\cdot g(x)$

2. $h'(3)$ for $h(x)=g(f(x))$

3. $h'(-2)$ for $h(x)=\dfrac{f(x)}{g(x)-4}$