Calculus AB CH.2 Review WS 2.1 - 2.5

Name________________________ Per.____

Match each derivative

1) $f(x)=\tan x$	d)	$a)$	$f'(x)=-\sin x$
2) $f(x)=\sec x$	c)	$b)$	$f'(x)=-\csc x\cot x$
3) $f(x)=\csc x$	b)	$c)$	$f'(x)=\sec x\tan x$
4) $f(x)=\sin x$	f)	$d)$	$f'(x)=\sec^2 x$
5) $f(x)=\cos x$	a)	$e)$	$f'(x)=-\csc^2 x$
6) $f(x)=\cot x$	e)	$f)$	$f'(x)=\cos x$

7) $f(x)=3x^2-7x+8$

$a)$ $f'(x)=$ $6x-7$

$b)$ $f'(2)=$ 5

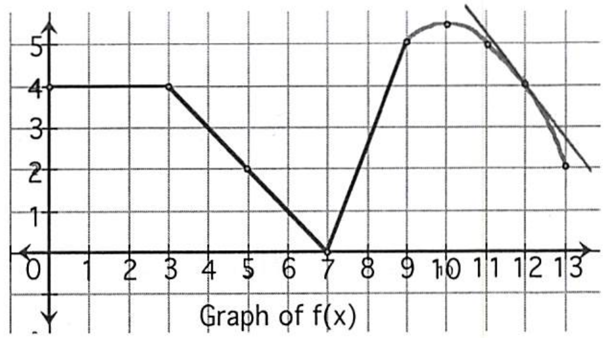
$c)$ Equation of the tangent line at $x=2$ point $(2,6)$

$y-6=5(x-2)$

$d)$ Equation of the normal line at $x=2$

$y-6=-\frac{1}{5}(x-2)$

Use picture at right for #8



8 $a)$ $f'(2)=$ 0 $b)$ $f'(3)=$ DNE $c)$ $f'(5)=$ -1

$d)$ $f'(8)=$ $\frac{5}{2}$ $e)$ $f'(9)=$ DNE $f)$ $f'(10)=$ 0

$g)$ $f'(12)\doteq$ $-\frac{4}{3}$ $h)$ Equation of tangent line at 12

$y-4=-\frac{4}{3}(x-12)$

9) $\lim\limits_{h\to0}\dfrac{\tan(x+h)-\tan x}{h}=$ $\sec^2 x$

10) $\lim\limits_{h\to0}\dfrac{3(x+h)^7-3x^7}{h}=$ $21x^6$

11) $\lim\limits_{h\to0}\dfrac{(1+h)^7-1}{h}=$ 7

12) $\lim\limits_{h\to0}\dfrac{\cos\left(\frac{\pi}{6}+h\right)-\frac{\sqrt{3}}{2}}{h}=$ $-\sin\left(\frac{\pi}{6}\right)=-\frac{1}{2}$

Find equation of the tangent line and normal line to the given equation at the given point.

3.7 13) $2xy^2+x=12$; $(4,-1)$

$2y^2+4xy\cdot\frac{dy}{dx}+1=0$

$\frac{dy}{dx}=\frac{-1-2y^2}{4xy}$

$\left.\frac{dy}{dx}\right|_{x=4,\,y=-1}=\frac{-3}{-16}$

tangent line

$y+1=\frac{3}{16}(x-4)$

normal line

$y+1=-\frac{16}{3}(x-4)$

3.7 14) Given: $x^2-6x+y^2+4y-12=0$ and $\dfrac{dy}{dx}=\dfrac{-2x+6}{2y+4}$

$a)$ Find the horizontal tangent(s).

$\frac{dy}{dx}=0 \Leftrightarrow x=3$

if $x=3$: $9-18+y^2+4y-12=0$

$y^2+4y-21=0$

$(y+7)(y-3)=0$

$y=-7$ $y=3$

Points: $(3,3)$ & $(3,-7)$

$b)$ Find the vertical tangent(s).

$\frac{dy}{dx}$ undefined if $y=-2$

$x^2-6x+4-8-12=0$

$x^2-6x-16=0$

$(x-8)(x+2)=0$

$x=8$ $x=-2$

Points: $(8,-2)$ & $(-2,-2)$

3.7 15) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$. $x^2 - 9y^2 = 7$

$2x - 9 \times 2y \times \frac{dy}{dx} = 0$

$\boxed{\frac{dy}{dx} = \frac{2x}{18y}}$

$2 - 18\left(\frac{dy}{dx}\right)^2 - 18y \cdot \frac{d^2y}{dx^2} = 0$

$2 - 18\left(\frac{4x^2}{18^2y^2}\right) - 18y\frac{d^2y}{dx^2} = 0$

$2 - \frac{4x^2}{18y^2} = 18y\frac{d^2y}{dx^2}$

$\boxed{\frac{d^2y}{dx^2} = \frac{1}{9y} - \frac{4x^2}{324y^3}}$

$f(3)=3$	$f'(3)=7$	$f(9)=-2$	$f'(9)=3$
$g(3)=-1$	$g'(3)=4$	$g(9)=0$	$g'(9)=6$

16) Use information above to find $h'(x)$ and $h'(3)$.

a) $h(x) = f(x)\cdot g(x)$

$h'(x) = f'(x).g(x) + f(x).g'(x)$

$h'(3) = 7.(-1) + 3.4$

$= -7 + 12$

$= 5$

b) $h(x) = g(f(x))$

$h'(x) = g'(f(x)) \times f'(x)$

$h'(3) = g'(f(3)) \times f'(3)$

$= g'(3) \times f'(3)$

$= 4 \times 7$

$= 21$

c) $h(x) = (f(3x))^3$

$h'(x) = 3f(3x)^2 \times f'(3x) \times 3$

$= 9f'(3x) \times (f(3x))^2$

$h'(3) = 9f'(9) \times (f(9))^2$

$= 9 \times 3 \times (-2)^2$

$= 108$

Find derivatives for each.

17) $f(x) = \frac{2}{x}$

$f'(x) = -\frac{2}{x^2}$

18) $f(x) = \cos(7x^3)$

$f'(x) = -\sin(7x^3) \times 21x^2$

$= -21x^2 \sin(7x^3)$

19) $f(x) = x^{7/9}$

$f'(x) = \frac{7}{9}x^{-2/9}$

$= \frac{7}{9x^{2/9}}$

20) $f(x) = \tan(\sec x)$

$f'(x) = \sec^2(\sec x).\sec x \tan x$

21) $f(x) = \cot 17x$

$f'(x) = -\csc^2(17x) \times 17$

$= -17\csc^2(17x)$

22) $f(x) = (\sin 5x)^4$

$f'(x) = 4(\sin 5x)^3.\cos(5x).5$

$= 20\sin^3 5x.\cos 5x$

23) $f(x) = x^2\sqrt{x^2-9}$

$f'(x) = 2x\sqrt{x^2-9} + x^2.\frac{2x}{2\sqrt{x^2-9}}$

$= 2x\sqrt{x^2-9} + \frac{x^3}{\sqrt{x^2-9}}$

$= \frac{2x(x^2-9) + x^3}{\sqrt{x^2-9}}$

$= \frac{3x(x^2-6)}{\sqrt{x^2-9}}$

24) $f(x) = 3x^3(5x^2+7)^5$

$f'(x) = 9x^2(5x^2+7)^5 + 15x^3(5x^2+7)^4(10x)$

$= 3x^2(5x^2+7)^4(3(5x^2+7) + 5x(10x))$

$= 3x^2(5x^2+7)^4(65x^2+21)$

25) $f(x) = \frac{x^2+5}{x^3-9}$

$f'(x) = \frac{2x(x^3-9) - 3x^2(x^2+5)}{(x^3-9)^2}$

$= \frac{2x^4 - 18x - 3x^4 - 15x^2}{(x^3-9)^2}$

$= \frac{-x^4 - 15x^2 - 18x}{(x^3-9)^2}$

$= \frac{-x(x^3+15x+18)}{(x^3-9)^2}$