optional. Quiz Mon

Calculus
Review 2.1-2.3

Name_____

1. Use the Definition of the Derivative to find the derivative of $f(x) = x^2 - 5x$.
2. Write an equation of the tangent line to the point (2,2) on the function $y = \frac{1}{4}x^3$. Make a sketch to show the function and the tangent line to the point indicated.

Find the derivatives of the following functions.

3. $f(x) = 2x - 3x^{-3}$ 4. $y = \frac{2}{x^3}$ 5. $g(x) = \sqrt[4]{x^3}$ 6. $f(x) = 2 + \sin x - \frac{\cos x}{3}$

6.1. $f(x) = 3x^5 \sin x$ 6.2. $y = \frac{2x + 5x^2}{x^3 - 7}$ 6.3. $g(x) = \tan x$ 6.4. $f(x) = 3\sin x + \csc x - \cot x$

7. Find the 5th derivative if $g(x) = 7x^4$ 7.5 Find the 6th derivative if $g(x) = x^5 + 7x^4$
8. Suppose the position of an object is given by the equation $s(t) = -16t^2 + 24$.
   a. What does the -16 and 24 represent?
   b. What time does the object hit the ground?
   c. Find the average velocity $\frac{\Delta s}{\Delta t}$ on the interval [0,2]
   d. Find the instantaneous velocity at $t = 2$.

Review 2.1–2.3

Key

1) $f(x)=x^2-5x$ Defn Deriv $= f'(x)=\lim_{\Delta x\to 0}\frac{f(x+\Delta x)-f(x)}{\Delta x}$.

$$=\lim_{\Delta x\to 0}\frac{(x+\Delta x)^2-5(x+\Delta x)-[x^2-5x]}{\Delta x}$$

$$=\lim_{\Delta x\to 0}\frac{x^2+2x\Delta x+(\Delta x)^2-5x-5\Delta x-x^2+5x}{\Delta x}$$

$$=\lim_{\Delta x\to 0}\frac{\Delta x(2x+\Delta x-5)}{\Delta x}=2x+-5$$

2) EQN line: $y-y_1=m(x-x_1)$ or $y=mx+b$.

need (x,y) & $m=f'(c)$

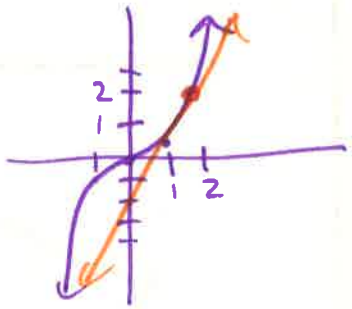
$y=\frac{1}{4}x^3$ @ $(\underset{x}{2},\underset{y}{2})$

$m=y'=\frac{3}{4}x^2$ $\quad m(2)=y'(2)=\frac{3}{4}(2)^2=3.$

$$\boxed{y-2=3(x-2)}$$

$y=3x-6+2$

$\boxed{y=3x-4}$



3) $f(x)=2x-3x^{-3}$

$f'(x)=2+9x^{-4}$

4) $y=\frac{2}{x^3}=2x^{-3}$

$y'=-6x^{-4}=\frac{-6}{x^4}$

5) $g(x)=\sqrt[4]{x^3}=x^{3/4}$

$g'(x)=\frac{3}{4}x^{-1/4}$

6) $f(x)=2+\sin x-\frac{\cos x}{3}$

$f'(x)=0+\cos x+\frac{1}{3}\sin x$.

6.1) $f(x)=3x^5\sin x$ Product Rule

$f'(x)=(3x^5)(\cos x)+(\sin x)(15x^4)$

(6.2) $y=\frac{2x+5x^2}{x^3-7}$ Quotient Rule

$$y'=\frac{(x^3-7)(2+10x)-(2x+5x^2)(3x^2)}{(x^3-7)}$$

6.3) $g(x)=\tan x$

$g'(x)=\sec^2 x$

6.4) $f(x)=3\sin x+\csc x-\cot x$

$f'(x)=3\cos x-\csc x\cot x+\csc^2 x$.

7) $g(x)=7x^4$

$g'(x)=7\cdot 4x^3$

$g''(x)=7\cdot 4\cdot 3x^2$

$g'''(x)=7\cdot 4\cdot 3\cdot 2x^1$

$g^{(4)}(x)=7\cdot 4\cdot 3\cdot 2\cdot 1\cdot x^0=\underbrace{7\cdot 4!}_{\text{constant}}$

$g^{(5)}(0)=0$

7.5) $g(x)=x^5+7x^4$

$g'(x)=5x^4+7\cdot 4x^3$

$g''(x)=5\cdot 4\cdot x^3+7\cdot 4\cdot 3x^2$

$g'''(x)=5\cdot 4\cdot 3x^2+7\cdot 4\cdot 3\cdot 2x$

$g^{(4)}(x)=5\cdot 4\cdot 3\cdot 2x^1+\underbrace{7\cdot 4\cdot 3\cdot 2\cdot 1}_{\text{constant}}$

$g^{(5)}(x)=\underbrace{5\cdot 4\cdot 3\cdot 2\cdot 1}_{\text{constant}}+0$

$g^{(6)}(x)=0$

8) $s(t)=-16t^2+24$ (a) -16 is half gravity in ft/s². 24 is initial height in feet.

(b) $0=-16t^2+24$

$16t^2=24$

$t=\pm\sqrt{\frac{24}{16}}\approx\pm 1.2247$

Hit ground at 1.224 sec

(c) ave vel. $=\frac{\Delta s}{\Delta t}=\frac{s(2)-s(0)}{2-0}=\frac{-40-24}{2-0}=\frac{-68}{2}=-34\frac{ft}{s}$

(d) $v(t)=s'(t)=-32t$ $\quad s'(2)=-64$ ft/s