Good morning Happy Monday!

Agenda:
-Warm Up

-Return Quiz and review

-Answer questions from HW, practice
-Show Sine and Cosine, prove d/dx(ex)

Warm UP:
Find the derivative of the following using tabel.

x	f	f'	g	g'
0	2	4	-2	6
1	6	5	1	-4
2	7	9	10	8

ⓐ $f-g$ $x=2$ ⓑ $f\cdot g$ $x=1$

ⓒ $\frac{\frac{1}{6}}{f}$ $x=0$ ⓓ $\frac{f}{g}$ $x=2$

$$\lim_{h\to 0}\frac{(x+h)-x}{h} \qquad \lim_{x\to a}\frac{f(x)-f(a)}{x-a}$$

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

$$\frac{1}{2\sqrt{x+4}}=\frac{1}{2\sqrt{5}}$$

- cusp/corner
- vertical tangent Line
- Any discontinuity

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

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

$$\boxed{y-38=27(x-3)}$$

$$\frac{1}{2\sqrt{5}} \qquad y-\sqrt{5}=\frac{1}{2\sqrt{5}}(x-1$$

$$\frac{1}{2\sqrt{x+4}}$$

$$\lim_{h\to 0} \frac{\sqrt{x+4+h}-\sqrt{x+4}}{h} \cdot \frac{\sqrt{x+4+h}+\sqrt{x+4}}{\sqrt{x+4+h}+\sqrt{x+4}}$$

$$\lim_{h\to 0} \frac{(\cancel{x+4}+\cancel{h})-(\cancel{x+4})}{\cancel{h}\left(\sqrt{x+4+h}+\sqrt{x+4}\right)} = \lim_{h\to 0} \frac{1}{\sqrt{x+4+h}+\sqrt{x+4}}$$

$$\frac{1}{\sqrt{x+4}+\sqrt{x+4}} = \frac{1}{2\sqrt{x+4}}$$

$$-16(t^2-4t+5)$$

$$(t+1)(t-5)$$

$$t=-1 \qquad t=5$$

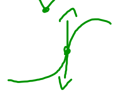
$$-32(5)+64 \qquad -5x^4$$

$$20x^3$$

$$-\frac{\pi}{4}x^{\pi-1}+\frac{4}{\sqrt{x}} \qquad -20x^3$$

5 Cusp/Corner

Vertical tangent line



(1)

$$\boxed{g(x)} = \frac{\sin(x)}{e^x} \quad \sin(x) \to f, \quad e^x \to g$$

$$\frac{g \cdot f' - (f\, g')}{g^2} = \frac{(e^x \cdot \cos x) - (\sin x \cdot e^x)}{(e^x)^2}$$

$$\frac{\cancel{e^x} \cos x - \cancel{e^x} \sin x}{e^{\cancel{2x}}\, x} \qquad \frac{e^x}{e^{2x}} = e^{-x}$$

$$\therefore \frac{e^x(\cos x - \sin x)}{e^{2x}} = \boxed{\frac{\cos x - \sin x}{e^x}}$$

$$\frac{x^x}{x^{x^1}}$$

(5)

$$f(x) = \overset{f}{e^x}\,\overset{g}{\cos x}$$

$$= e^x \cdot -\sin x + \cos x\, e^x$$

$$\boxed{-e^x \sin x + e^x \cos x}$$

$$e^x(\cos x - \sin x)$$

(6)

$$x^{\frac{1}{2}} \sin x$$

$$x^{\frac{1}{2}} \cos x + \frac{1}{2x^{1/2}} \sin x$$

$$\sqrt{x} \cos x + \frac{\cancel{1}\,2}{\cancel{2}\sqrt{x}} \sin x$$

17 $\overset{f}{x}\,\overset{g}{\cos x}$ @ $x=\frac{\pi}{4}$

$x(-\sin x)+\cos x\cdot 1$

$f'(x)=-x\sin x+\cos x$

@ $\pi/4$ $\boxed{-\frac{\pi}{4}\frac{\sqrt{2}}{2}+1\frac{\sqrt{2}}{2}}=$

$-\frac{1}{4}\pi+\frac{4}{4}$

$$\boxed{\begin{array}{l}\text{Position: } s(t) \\ \text{velocity: } v(t) = s'(t)\end{array}}$$

speed
$|v(t)|$

Acceleration: $a(t) = v'(t) = s''(t)$

$-16(t^2 - 4t + 5)$

$-16(2t - 4)$

$\boxed{-32t + 64 = v(t) \quad ft/sec}$

$v'(t) = -32 \; ft/sec/sec \quad ft/sec^2$

$$t^3 - \frac{7}{2}t^2 - 6t = s(t)$$

(a) $v(t) = 3t^2 - 7t - 6$

(b) $t = 2 \quad 3(2)^2 - 7(2) - 6 = -8 \ \frac{\text{units}}{\text{sec}}$

$t = 4 \quad 3(4)^2 - 7(4) - 6 = 14 \ \frac{\text{units}}{\text{sec}}$

(c) $s'(t) = v(t) = 0$

$3t^2 - 7t - 6 = 0$

5 $\quad f \quad g$

$f(x) = e^x \cdot \cos x$

$f g' + g \cdot f'$

$e^x \cdot -\sin x + \cos x \, e^x$

$-e^x \sin x + e^x \cos x = e^x \cos x - e^x \sin x$

3 $h(t) = \overset{f}{\sqrt{t}}\,\overset{g}{(1-t^2)}$ $\quad f' \quad t^{1/2}$

$(t^{1/2} \cdot -2t) + (1-t^2) \cdot \frac{1}{2\sqrt{t}} \leftarrow \frac{1}{2} \cdot t^{-\frac{1}{2}}$

$\frac{1}{2} + \frac{2}{2}$

$-2t^{\frac{3}{2}} + \frac{1-t^2}{2t^{1/2}}$ $\qquad \frac{1+x}{5}$

$-2t^{3/2} + \left(\frac{1}{2t^{1/2}} - \frac{1}{2}t^{3/2}\right)$ $\qquad \frac{1}{5} + \frac{x}{5}$

$-\frac{5}{2}t^{3/2} + \frac{1}{2t^{1/2}}$

9. $h(x) = \dfrac{\sqrt{x}}{x^3+1} \begin{matrix} \to f \\ \to g \end{matrix}$

$$\frac{gf' - (fg')}{g^2} =$$

$$\frac{(x^3+1)\frac{1}{2x^{1/2}} - (x^{1/2}\cdot(3x^2))}{(x^3+1)^2}$$

$$\frac{\frac{x^3+1}{2x^{1/2}} - 3x^{\frac{5}{2}}}{(x^3+1)(x^3+1)} = \frac{\left[\frac{1}{2}x^{\frac{5}{2}} + \frac{1}{2x^{1/2}}\right] - 3x^{\frac{5}{2}}}{(x^3+1)(x^3+1)}$$

$\dfrac{x^3+1}{2x^{1/2}} \to \dfrac{x^3}{2x^{1/2}} + \dfrac{1}{2x^{1/2}}$

$$\frac{-\frac{5}{2}\cdot x^{5/2} + \frac{1}{2x^{1/2}}}{(x^3+1)^2} = \frac{\frac{1}{2}\left(-5x^{5/2} + \frac{1}{x^{1/2}}\right)}{x^6+2x^3+1}$$

(11) $f(x) = \dfrac{x^2}{2\sqrt{x}+1}$ $\quad \dfrac{f}{g}$

$2x^{1/2}$

$x^{-1/2}$

$$\frac{g \cdot f' - f g'}{g^2} =$$

$$\frac{(2x^{1/2}+1)\cdot(2x) - [x^2 \cdot x^{-\frac{1}{2}}]}{(2\sqrt{x}+1)^2}$$

$$\frac{[4x^{3/2}+2x] - x^{3/2}}{4x+4\sqrt{x}+1} = \boxed{\frac{3x^{3/2}+2x}{4x+4\sqrt{x}+1}}$$

(12) $f(t) = \dfrac{\cos t}{t^3} \Rightarrow$

$$\frac{t^3 \cdot -\sin t - (3t^2 \cos t)}{(t^3)^2}$$

$$\frac{-\cancel{t^3}^{1}\sin t - (3\cancel{t^2}\cos t)}{t^{\cancel{6}4}}$$

$$= \boxed{\frac{-t\sin t - 3\cos t}{t^4}}$$

Title: Oct 21-12:29 PM (11 of 12)

Position: $s(t) = -t^2 + 5t - 6$

Velocity: $v(t) = s'(t) = -2t + 5$

acceleration: $a(t) = v'(t) = s''(t)$

$= -2$

A) $v(t) = 3t^2 - 7t - 6$

B) $v(2) = 3(2)^2 - 7(2) - 6$

$v(4) = 3(4)^2 - 7(4) - 6$

C) $v(t) = 3t^2 - 7t - 6 = 0$