Name: ______________________________________ Date: ____________

AP Calc AB: Derivatives of Inverse Trig Functions Ms. Loughran

Do Now:

1. If $f(x)=\sin^2 3x$, find $f'\left(\frac{\pi}{4}\right)$.

$f'(x) = 2\sin(3x)\cos(3x)\cdot 3$

$f'(x) = 6\sin(3x)\cos(3x)$

$f'(\frac{\pi}{4}) = 6\sin(\frac{3\pi}{4})\cos(\frac{3\pi}{4})$

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

2. If $f(x)=5e^{2x}-4$, find $f'(\ln 3)$.

$f'(x) = 5e^{2x}\cdot 2 = 10e^{2x}$

$f'(\ln 3) = 10e^{2\ln 3} = 10e^{\ln 3^2} = 10\cdot 3^2 = 90$

3. If $f(x)=\sec^2(e^{\cot^2(3x)})-\tan^2(e^{\cot^2(3x)})$, find $f'\left(\frac{\pi}{4}\right)$.

$\boxed{* \tan^2 x + 1 = \sec^2 x *}$

$1 = \sec^2 x - \tan^2 x$

$f(x) = 1$

$f'(x) = 0$

$f'(\frac{\pi}{4}) = 0$

Exam 2

(11) $3x-4y=0$

$3x=4y$

$\frac{3}{4}x=y$

$m_{tan}=\frac{3}{4}$

QI

$y=x^3+k \quad , k=?$

$y'=3x^2$

$\frac{3}{4}=\frac{3x^2}{1}$

$12x^2=3$

$x^2=\frac{1}{4}$

$x=\pm\frac{1}{2}$

$y=\frac{3}{4}\left(\frac{1}{2}\right)=\frac{3}{8}$

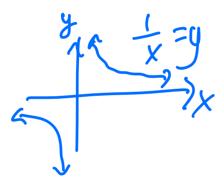
$y=x^3+k$

$\frac{3}{8}=\left(\frac{1}{2}\right)^3+k$

$\frac{3}{8}=\frac{1}{8}+k$

$\frac{2}{8}=k$

(B) $\frac{1}{4}$



From somewhere:

$$\lim_{x\to 0}\frac{\sin 4x}{x^2}=\lim_{x\to 0}\left(\overset{4}{\frac{\sin 4x}{x}}\cdot\overset{dne}{\frac{1}{x}}\right)=dne$$

Exam 1

(4) $$f(x)=\begin{cases}\dfrac{\sqrt{2x+5}-\sqrt{x+7}}{x-2} & x\neq 2 \quad x>2, x<2\\ c & x=2\end{cases}$$

$$\lim_{x\to 2}\left(\frac{\left(\sqrt{2x+5}-\sqrt{x+7}\right)}{x-2}\cdot\frac{\left(\sqrt{2x+5}+\sqrt{x+7}\right)}{\left(\sqrt{2x+5}+\sqrt{x+7}\right)}\right)$$

$$\lim_{x \to 2} \frac{\cancel{2x+5-(x+7)}^{\,x-2}}{\cancel{(x-2)}\left(\sqrt{2x+5}+\sqrt{x+7}\right)}$$

(B)

$$\lim_{x \to 2} \frac{1}{\sqrt{2x+5}+\sqrt{x+7}} = \frac{1}{3+3} = \frac{1}{6}$$

③ $h(x) = \begin{cases} 3x^2-2 & x<-1 \\ f(x) & x \geq -1 \end{cases}$

$f(x) = 3(-1)^2-2 = 1$

$f(x) = 1$ @ $x=-1$

$f(-1) = 1$

(A) x^3-1

$(-1)^3-1$

$-1-1$

-2

(B) 2^{x-1}

2^{-1-1}

2^{-2}

(E) $\cos(x+1)$

$\cos(-1+1)$

$\cos 0$

1

Exam 2

(4) $f(x) = \frac{x}{\tan x}$ $\qquad f'\left(\frac{\pi}{4}\right)$

$$f'(x) = \frac{\tan x\,(1) - x\sec^2 x}{(\tan x)^2} \qquad \left(\frac{2}{\sqrt{2}}\right)^2$$

$$f'\left(\frac{\pi}{4}\right) = \frac{\tan\left(\frac{\pi}{4}\right) - \frac{\pi}{4}\sec^2\left(\frac{\pi}{4}\right)}{\left(\tan\frac{\pi}{4}\right)^2}$$

$$f'\left(\frac{\pi}{4}\right) = \frac{1 - \frac{\pi}{4}(2)}{1^2} = 1 - \frac{2\pi}{4} = 1 - \frac{\pi}{2}$$

(E)

Exam 3

$\tan\frac{\pi}{3} = \sqrt{3}$

(11) $y = 2\ln(\csc x)$ at $x = \frac{\pi}{3}$

$$y' = 2 \cdot \frac{1}{\cancel{\csc x}} \cdot -\cancel{\csc x}\cot x = -2\cot x$$

$$y'\left(\frac{\pi}{3}\right) = -2\cot\frac{\pi}{3} = -2\left(\frac{1}{\sqrt{3}}\right) = \frac{-2}{\sqrt{3}}$$

↑ m tan line

$m_{\text{normal}} = +\frac{\sqrt{3}}{2}$ $\qquad$ (A)

Exam 1

② $\lim_{x \to 0} \left(\left(\frac{1-\cos x}{2\sin^2 x}\right) \cdot \frac{(1+\cos x)}{(1+\cos x)} \right) = \lim_{x \to 0} \frac{\cancel{\sin^2 x}}{2\cancel{\sin^2 x}(1+\cos x)} = \frac{1}{4}$

$\sin^2 x$

$1-\cos^2 x$

(C)

$$\frac{1-\cos x}{2(1-\cos^2 x)} = \frac{\overset{1}{\cancel{1-\cos x}}}{2\cancel{(1-\cos x)}(1+\cos x)}$$