Name ____________________

Review (1)

…rivative of each of the following.

$-3x^2 \csc^2(x^3)$

$-\csc^2(x^3) \cdot 3x^2$

… $\frac{4}{x^3}$ 2. $f(x) = \cot x^3$ 3. $h(x) = 2x^5 - \frac{4}{3}$…

…x 5. $y = \sqrt[3]{9x^2 - 5}$ 6. $g(x) = x^4 \sec x$…

$\frac{3x^2}{(4x-1)^3}$ 8. $y = (x^2-5)^{-3}(8x+3)^2$ 9. $g(x) = \frac{\tan^2 x}{\sec^3 x}$

$$y' = \frac{(4x-1)^{\cancel{3}\,1} \cdot 6x - 3x^2 \cdot 3 \cdot \cancel{(4x-1)^2} \cdot 4}{(4x-1)^{\cancel{6}\,4}} = \frac{6x(4x-1) - \ldots}{(4x - \ldots}$$

$$= 24x^2 - 6x - 36x^2 = \frac{-12x\ldots}{(4x\ldots}$$

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: Limit Def'n of a Derv

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e Limit Definition of a Derivative to find the

ive of the following functions.

$= 5x^2 + 3x - 8$

$$\lim_{h\to 0} \frac{5(x+h)^2+3(x+h)-8-(5x^2+3x-8)}{h}$$

$$\cancel{5x^2}+10xh+5h^2$$

$$\frac{\cancel{5(x^2+2xh+h^2)}+\cancel{3x}+3h-\cancel{8}-\cancel{5x^2}-\cancel{3x}+\cancel{8}}{h}$$

$$\lim_{h\to 0} \frac{10xh+5h^2+3h}{h} = 10x+5h+3$$

$$\boxed{m_{tan} = 10x+3}$$

$= 3x^2 - 4x$

$) = 5x - 8$

ermine the first derivative of the following functions.

$\prime = \left(2x^4 + 5x\right)^5$

2) $y = 2x^{-3} + \dfrac{3}{\sqrt[5]{x^3}} + \dfrac{2}{3x^2}$

$\prime = \sqrt{3x^2 + 2x - 1}$

4) $f(x) = x^3\left(x^2 + 2\right)^{1/2}$

$g(x) = x^2 \sin x - 2\sec x$

6) $y = \tan\left(3x^4\right)$

$\prime = \cos\left(\sin\left(x^2\right)\right)$

8) $h(x) = \dfrac{4}{\left(x^3 + 4\right)^3}$

$f(x) = \cot^2\left(3x^2 - 6x\right)$

10) $y = \dfrac{\tan(2x+1)}{\sin(3x)}$ use quotie

l the first derivatives and simplify the answer for number 12.

$y = \left(x^2 - x\right)\left(x^3 + 2\right)$

12) $f(x) = \dfrac{(3x-4)}{\left(x^2+3\right)}$ use quotier

4. Find the second derivative for the following functions.

$y = 3x^5 - 2x^4 + 10x^{1/5} + 3x^{-3}$

14) $y = \tan(5x)$

For $f(x) = \left(x^2 - 3x\right)^2$ find the equation of the tangent line when $x = 1$.

For $y = x\cos^2(x)$ find the equation of the tangent line when $x = \pi/3$.

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ine the first derivative of the following functions.

$2x^4+5x)^5$

$5(2x^4+5x)^4(8x^3+5)$

2) $y = 2x^{-3} + \frac{3}{\sqrt[5]{x^3}} + \frac{2}{3x^2} = 2x^{-3} + 3$

$y' = -6x^{-4} - \frac{9}{5}x^{-\frac{8}{5}} - \frac{4}{3}x^{-}$

$\sqrt{3x^2+2x-1} = (3x^2+2x-1)^{1/2}$

$y' = \frac{1}{2}(3x^2+2x-1)^{-1/2}(6x+2)$

4) $f(x) = x^3(x^2+2)^{1/2}$

$y' = 3x^2(x^2+2)^{1/2} + x^3 \cdot \frac{1}{2}(x$

$y' = 3x^2(x^2+2)^{1/2} + x^4(x^2$

$x) = x^2 \sin x - 2\sec x$

$) = 2x\sin x + x^2\cos x - 2\sec x\tan x$

6) $y = \tan(3x^4)$

$y' = \sec^2(3x^4)(12x^3)$

$= \cos(\sin(x^2))$

$= -\sin(\sin(x^2))(\cos(x^2))(2x)$

$y' = -2x(\sin(\sin(x^2)))(\cos(x^2))$

8) $h(x) = \dfrac{4}{(x^3+4)^3}$

$y' = \dfrac{\cancel{(x^3+4)^3\,0} - 4\cdot 3\cancel{(x^3+4)^2}\cdot}{(x^3+4)^{\cancel{6}\,4}}$

$\dfrac{-36x^2}{(x^3+4)^4}$

$) = \cot^2(3x^2 - 6x)$

10) $y = \dfrac{\tan(2x+1)}{\sin(3x)}$ use quotie

$f'(x) = 2\cot(3x^2-6x)\cdot(-\csc^2(3x^2-6x))\cdot(6x-6)$

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$$y' = \frac{\sin(3x)\cdot\sec^2(2x+1)\cdot 2 - \tan(2x+1)\cdot\cos(3x)\cdot 3}{\sin^2(3x)}$$

t derivatives and simplify you answers.

$\cdot x)(x^3+2)$

12) $f(x)=\dfrac{(3x-4)}{(x^2+3)}$ use quoti

$y' = (2x-1)(x^3+2) + (x^2-x)(3x^2)$

$y' = \cancel{2x^4} + 4x - \cancel{x^3} - 2 + \cancel{3x^4} - \cancel{3x^3}$

$\boxed{y' = 5x^4 - 4x^3 + 4x - 2}$

12) $y' = \dfrac{(x^2+3)\cdot 3 - (3x-4)\cdot 2x}{(x^2+3)^2} = \dfrac{3x^2+9-6x^2+8x}{(x^2+3)^2}$

$\boxed{y' = \dfrac{-3x^2+8x+9}{(x^2+3)^2}}$

he second derivative for the following functions.

$= 3x^5 - 2x^4 + 10x^{1/5} + 3x^{-3}$

14) $y = \tan(5x)$

$y' = 15x^4 - 8x^3 + 2x^{-4/5} - 9x^{-4}$

$\boxed{y'' = 60x^3 - 24x^2 - \frac{8}{5}x^{-9/5} + 36x^{-5}}$

14 $y' = \sec^2(5x) \cdot 5$

$y' = 5\sec^2(5x)$

$y'' = 10\sec(5x) \cdot \sec(5x) \cdot \tan(5x) \cdot 5$

$\boxed{y'' = 50 \cdot \sec^2(5x) \cdot \tan(5x)}$

or $f(x) = (x^2 - 3x)^2$ find the equation of the tangent line when x =

$f'(x) = 2(x^2 - 3x) \cdot (2x - 3)$

$f'(1) = 2(1 - 3) \cdot (2 - 3)$

$= -4 \cdot -1$

$\boxed{= 4 = m}$

$y = 4x + 0$

$\boxed{y = 4x}$

$f(1) = (1^2 - 3 \cdot 1)^2$

$= 4$

$(1, 4)$ $m = 4$

$y = mx + b$

$4 = 4 \cdot 1 + b$

$4 = 4 + b$

$0 = b$

For $y = x\cos^2(x)$ find the equation of the tangent line when $x = \pi/3$

$y' = 1\cdot\cos^2 x + x\cdot 2\cos(x)\cdot(-\sin x)$

$y' = \cos^2 x - 2x\cos x\sin x$

$y'(\pi/3) = \cos^2(\pi/3) - 2(\pi/3)\cdot\cos(\pi/3)\cdot\sin(\pi/3)$

$= {}^-0.203 = m$

$y = \frac{\pi}{3}\cdot\cos^2(\pi/3) = 0.262$

$m = {}^-0.203$

$(\pi/3, .262)$

$y = mx + b$

$.262 = {}^-.203(\pi/3) + b$

$.475 = b$

$\boxed{y = {}^-.203x + .475}$

. $y = (x^2 - 5)^{-3}(8x + 3)^2$

$y' = -3(x^2-5)^{-4}(2x)(8x+3)^2 + (x^2-5)^{-3} \cdot 2(8x$

$y' = -6x(x^2-5)^{-4}(8x+3)^2 + 16(x^2-5)^{-3}(8$

$$= 3x^2 - 4x$$

$$\lim_{h\to 0} \frac{3(x+h)^2 - 4(x+h) - (3x^2 - 4x)}{h}$$

$$\cancel{3x^2} + 6xh + 3h^2$$

$$\lim_{h\to 0} \frac{\cancel{3(x^2+2xh+h^2)} \cancel{-4x} - 4h \cancel{-3x^2} \cancel{+4x}}{h}$$

$$\lim_{h\to 0} \frac{6xh + 3h^2 - 4h}{h} = 6x + 3h - 4$$

$$\boxed{m_{tan} = 6x - 4}$$

$= 5x - 8$

$$\lim_{h \to 0} \frac{5(x+h) - 8 - (5x - 8)}{h}$$

$$\lim_{h \to 0} \frac{\cancel{5x} + 5h \cancel{- 8} \cancel{- 5x} \cancel{+ 8}}{h} = \frac{5\cancel{h}}{\cancel{h}} = 5$$

$$\boxed{m_{tan} = 5}$$