Unit 4 Quiz Review                                    Name_____

**Differentiate each function with respect to $x$.**

1) $y = (-3x^2 + 5)^5$

$5(-3x^2+5)^4 \cdot -6x$

$\boxed{-30x(-3x^2+5)^4}$

2) $y = (5x^2 + 3)^{\frac{1}{2}}$

$\frac{1}{2}(5x^2+3)^{-1/2} \cdot 10x$

$\boxed{5x(5x^2+3)^{-1/2}}$

3) $y = (-2x^4 + 5)^{-3}$

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

$\boxed{24x^3(-2x^4+5)^{-4}}$

4) $y = \sqrt{4x^2 + 1}$

$\frac{1}{2}(4x^2+1)^{-1/2} \cdot 8x$

$\boxed{4x(4x^2+1)^{-1/2}}$

5) $f(x) = (3x - 1)(4x^5 + 3)^2$

$(3x-1) \cdot 2(4x^5+3)(20x^4)$

$\boxed{40x^4(3x-1)(4x^5+3) + 3(4x^5+3)^2}$

6) $y = \dfrac{(5x^3 + 1)^{-4}}{-x^5 + 4}$  high  low

$\dfrac{(-x^5+4) \cdot -4(5x^3+1)^{-5} \cdot 15x^2 \phantom{...} }{}$

$\boxed{\dfrac{-60x^2(-x^5+4)(5x^3+1)^{-5} + 5x^4(5x^3+1)^{-4}}{(-x^5+4)^2}}$

7) $y = \left(\dfrac{-2x^5 - 3}{4x^3 - 1}\right)^2$

$\boxed{2\left(\dfrac{-2x^5-3}{4x^3-1}\right) \cdot \dfrac{(4x^3-1)(-10x^4) - (-2x^5-3)(12x^2)}{(4x^3-1)^2}}$

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

$$5\left((5x^5+2)^4+4\right)^4 \cdot 4(5x^3+2)^3 \cdot 25x^4$$

**For each problem, use implicit differentiation to find $\dfrac{dy}{dx}$ in terms of $x$ and $y$.**

9) $1 = 3x^2 - 5y^3$

$$0 = 6x - 15y^2 \cdot y'$$

$$\frac{-6x}{-15y^2} = y'$$

$$y' = \frac{2x}{5y^2}$$

10) $2x^2 + 2y^2 + 5y = 3$

$$4x + 4yy' + 5y' = 0$$

$$4yy' + 5y' = -4x$$

$$y' = \frac{-4x}{4y+5}$$

**Write the equation of the tangent line through the given point.**

11) $2 = 2x^3 - xy$ at $(-2, 9)$

$$0 = 6x^2 - (xy' + y)$$

$$-6x^2 = -(xy' + y)$$

$$6x^2 = xy' + y$$

$$\frac{6x^2 - y}{x} = y'$$

$$\frac{6(4) - 9}{-2} \qquad \frac{-15}{2}$$

$$y - 9 = -\frac{15}{2}(x+2)$$

$$y = -\frac{15}{2}x - 6$$

**Differentiate each function with respect to $x$.**

12) $y = \sin(4x^3)$

$$12x^2\cos(4x^3)$$

13) $y = \cos^3 x$

$$(\cos x)^3$$

$$-3\cos^2 x \cdot \sin x$$