ICM Name_____ ID: 1

Chain, Product, Quotient, Implicit

Date_____ Period____

Differentiate each function with respect to *x*.

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

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

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

4) $y = \sqrt{(5x - 1)^{-4} + 5}$

5) $y = \dfrac{3}{4x^2 + 4}$

6) $y = (2x^4 - 2) \cdot 3x^2$

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

7) $5x = -y^2 + 5$

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

9) $4x^2 + 5y^3 + y^2 = 1$

10) $2x^2 = -3xy^2 - 4x^2y^2 + 2$

Answers to Chain, Product, Quotient, Implicit (ID: 1)

1) $\frac{dy}{dx} = 5(3x^3 + 5)^4 \cdot 9x^2$
$= 45x^2(3x^3 + 5)^4$

2) $\frac{dy}{dx} = 3(-x^3 + 5)^2 \cdot -3x^2$
$= -9x^2(-x^3 + 5)^2$

3) $\frac{dy}{dx} = 2\left((x^5 + 4)^4 - 1\right) \cdot 4(x^5 + 4)^3 \cdot 5x^4$
$= 40x^4(x^5 + 4)^3\left((x^5 + 4)^4 - 1\right)$

4) $\frac{dy}{dx} = \frac{1}{2}\left((5x - 1)^{-4} + 5\right)^{-\frac{1}{2}} \cdot -4(5x - 1)^{-5} \cdot 5$
$= -\frac{10}{\left(5(5x - 1)^4 + 1\right)^{\frac{1}{2}} \cdot (5x - 1)^3}$

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

6) $\frac{dy}{dx} = (2x^4 - 2) \cdot 6x + 3x^2 \cdot 8x^3$
$= 36x^5 - 12x$

7) $\frac{dy}{dx} = -\frac{5}{2y}$

8) $\frac{dy}{dx} = \frac{2x}{-3 - 2y}$

9) $\frac{dy}{dx} = -\frac{8x}{15y^2 + 2y}$

10) $\frac{dy}{dx} = \frac{-3y^2 - 8xy^2 - 4x}{6xy + 8x^2y}$