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Derivative Worksheet #1

Find the derivative of the following functions:

1. $f(t) = 7t - 12$

2. $f(x) = 6$

3. $f(x) = 12x^4 + 3x^2 + 7$

4. $y = -6x^3 + 5x^2 - 8x + 2$

5. $d(t) = 360 + 40t - 16t^2$

6. $g(t) = 7t^4 - 4t^3 + 6t^2 + 9t - 19$

7. $y = 2 - 4x + 7x^2 - 9x^3$

8. $f(x) = 0$

9. $f(x) = e^x$

10. $f(x) = e^2$

11. $f(t) = (t + 2)(t - 1)$

12. $y = (2x + 1)(3x + 4)$

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Derivative Worksheet #2

Find the derivative of the following functions using product/quotient rules:

1. $f(t) = (7t - 12)(4t^3)$

2. $f(x) = 6(7x - 3)(2x^2)$

3. $f(x) = (2x^4 + 3x^2 + 7)(9 - x^3)$

4. $y = -(6x^3 + 5x^2 - 8x + 2)(4 - x)$

5. $d(t) = (4t)(10 - 4t)$

6. $g(t) = (7t^4 - 4t^3)(6t^2 + 9t - 19)$

7. $y = (2 - 4x) / (x^2 - 3x^3)$

8. $f(x) = (2 - 3x + 5x^2 - 8x^3) / 9$

9. $f(x) = e^x / x$

10. $f(x) = e^2 / x^4$

11. $f(t) = (6t + 2) / (7t - 1)$

12. $y = (2x + 1) / (3x + 4)$

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Product & Quotient Rule Practice:

1. $\frac{d}{dx}\left(x^3-2x+1\right)\left(x^4+x-3\right)$

2. $\frac{d}{dx}\left(\frac{x^2+1}{x^2-1}\right)$

3. $\frac{d}{dx}\left(\frac{x^2}{\sin x}\right)$

4. $\frac{d}{dx}(\sin x\cos x)$

5. $\frac{d}{dx}\left(\sin^2 x\right)$

6. $\frac{d}{dx}\left(\frac{x+1}{\sqrt{x}}\right)$

7. $\frac{d}{dx}\left(\frac{1+\sin x}{1-\cos x}\right)$

8. $\frac{d}{dx}\left(\sqrt{x}e^x\right)$

9. $\frac{d}{dx}\left(\frac{e^x}{1+x}\right)$

10. $\frac{d}{dx}\left(2^x e^x\right)$

11. $\frac{d}{dx}\left(\frac{3^x}{x+1}\right)$

12. $\frac{d}{dx}\left(\frac{x^2-x-2}{x+1}\right)$

13. Find the equation of the tangent line to the curve $y=\frac{\sqrt{x}}{x+1}$ at x=4

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Chain Rule Practice

1. $\frac{d}{dx}\cos\left(x^2\right)$

2. $\frac{d}{dx}\sqrt{1+\frac{1}{x}}$

3. $\frac{d}{dx}\left(3+\left(x^3-2x\right)^5\right)^8$

4. $\frac{d}{dx}\tan^3\sqrt{x}$

5. $\frac{d}{dx}\sqrt{x^3+6x}$

6. $\frac{d}{dx}\sec\left(x^2\right)$

7. $\frac{d}{dx}\sec^2 x$

8. $\frac{d}{dx}\cos^3\left(x^2\right)$

9. $\frac{d}{dx}\sin 2x\cos 3x$

10. $\frac{d}{dx}x^2\cos e^x$

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PRACTICE 1 - Implicit Differentiation

Find $\frac{dy}{dx}$:

1. $y^3 + 7y = x^3$

2. $4x^2y - 3y = x^3 - 1$

3. $x^2 + 5y^3 = x + 9$

4. Find $D_t y$ if $t^3 + t^2y - 10y^4 = 0$

5. Find the equation of the <u>*tangent line*</u> to the curve $y^3 - xy^2 + \cos(xy) = 2$ at $x = 0$.

6. Find $\frac{d^2y}{dx^2}$ at (2,1) if $2x^2y - 4y^3 = 4$.

7. Find the equation of the <u>*normal line*</u> (line perpendicular to the tangent line) to the curve $8(x^2 + y^2)^2 = 100(x^2 - y^2)$ at the point (3,1).

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PRACTICE 2 - Implicit Differentiation

Compute $\frac{dy}{dx}$ for the problems below:

1. $x^2 + y^2 = 1$
2. $x^2 - \frac{1}{2}y^2 = 1$
3. $2x^3y^2 + 2 = 4x$
4. $x^4y^4 + 3x^2y^2 = 1$
5. $5xy + 3x^2 = 4y^2$
6. $(x + y)^2 = 4xy$
7. $e^{xy} + xy = 3x^2$
8. $ln(x^2 + y^2) = y^3$
9. $\frac{x+y}{xy} + 2x = \frac{1}{5}y^5$
10. $\frac{x}{y} + \frac{y}{x} = e^{x^2+2xy+y^2}$

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PRACTICE 3 - Implicit Differentiation

1. Differentiate each expression, treating y as a function of x. (If you cannot differentiate single expressions accurately, you certainly cannot use implicit differentiation on equations.)

(a) $\frac{d\ 5y^3}{dx} =$

(b) $\frac{d}{dx}(7x^5 + 2y^5) =$

(c) $\frac{d\ \sin(2y - e^x)}{dx} =$

(d) $\frac{d}{dx}(\ \ln(3x + 2y)\ ) =$

(e) $\frac{d\ x^3y^7}{dx} =$

(f) $\frac{d}{dx}\ e^{(3x + 5y)} =$

(g) $\frac{d}{dx}(\ 7y + e^{5y}\ ) =$

(h) $\frac{d}{dx}(\ \ln(3+y) + \cos(2y) + \ln(5)\ ) =$

2. Use Implicit Differentiation on each equation to find $\frac{dy}{dx}$ (or y')

(a) $5x^3 + 2y^5 = 7 + y^2 + 3x$

(b) $x^3 + 2y^3 = 7y + 5x + 4$

(c) $\ln(\ 3 + y\ ) + \cos(\ 5x\ ) = e^y + x^2$

(d) $xy + \cos(\ 2y\ ) = \ln(\ 7 - x^3\ ) + 7^x\ + 3$

(e) $\tan(\ 2 + 5y^2\ ) + x^2y^3 = \ln(\ 3 + y\ )$

(f) $e^{3x} + \sin(\ 5y\ ) = y^3 + x^5 + 4$