Warm Up

Differentiate the following...

$$(x^{3} + y^{5})^{6} + 3xy = 2x^{4}y^{5}$$

$$((x^{3} + y^{5})^{5}(3x^{3} + 5y^{4})^{4} + 3y^{5}x^{4}y^{5} = 8x^{3}y^{5} + 2x^{4}(5y^{4})^{4}y^{5}$$

$$(3x^{3} + y^{5})^{5} + 3xy^{4}(x^{3} + y^{5})^{5} + 3xy^{4}(x^{3} + y^{5})^{5} + 3xy^{5} + 3xy^{4} + 3y^{5} + 3xy^{5} + 3xy^{5} + 3xy^{5} + 3y^{5} + 3xy^{5} + 3y^{5} + 3y^{5} + 3xy^{5} + 3y^{5} + 3y$$

Higher Order Derivatives

We can continue to find the derivatives of a derivative. We find the

- second derivative by taking the derivative of the first,
- o third derivative by taking the derivative of the second ... etc

Examples:

1. Determine the higher order derivatives for f(x)...

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

$$f'(x) = 4x^{3} - 6x^{2} + 3$$

$$f''(x) = 2x^{2} - 12x$$

$$f'''(x) = 24x - 12$$

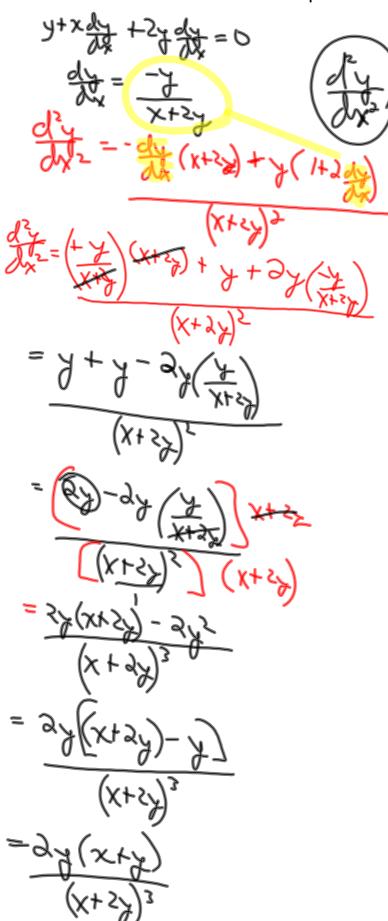
$$f''''(x) = 24$$

$$f'''''(x) = 24$$

$$f'''''(x) = 24$$

2. Determine f''(x) given that $f(x) = \frac{5}{\sqrt{2-3x}}$ $f(x) = 5(2-3x)^{-1/2}$ $f''(x) = \frac{5}{2}(2-3x)^{-2/2}(-3)$ $f'''(x) = \frac{13}{2}(2-3x)^{-2/2}(9) - 2(-3)(-3)$ $f'''(x) = \frac{13}{2}(2-3x)^{-2/2}(-3x) - 2(-3)(-3)(-3)$

3. Find the second derivative of the implicit function $xy + y^2 = 4$.



4. Determine the fourth derivative of y = cos(5x)

$$y'' = -\sin(sx)(s)$$

$$y''' = -\cos(sx) 2s$$

$$y'''' = \sin(sx)/2s$$

$$y'''' = \cos(sx)/(62s)$$

$$y'''' = -\cos(sx)/(62s)$$

Practice...

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#2, 3, 4, 5, 7 (a)