

3) Find $\frac{d^2y}{dx^2}$ for the function $y = 3\sin(2x^2) - 5x^3 + 8x$

$u = 2x$
 $u' = 4x$
 $y = 3\sin(u) - 5x^3 + 8x$
 $y' = 3\cos(u) \cdot u' - 15x^2 + 8$
 $y' = 12x\cos(2x^2) - 15x^2 + 8$

$y' = 12x\cos(2x^2) - 15x^2 + 8$
 $y'' = [12x(-4x\sin(2x^2))] - 12\cos(2x^2) - 30x + 0$

$f'(x) = -48x\sin(2x^2) - 12\cos(2x^2) - 30x$

4) Find $\frac{d^5y}{dx^5}$ given that $\frac{d^3y}{dx^3} = 2e^{3x} + 3x^4 - \frac{x^2}{2}$

$y''' = 2e^{3x} + 3x^4 - \frac{x^2}{2}$
 $y^{(4)} = 6e^{3x} + 12x^3 - x$
 $y^{(5)} = 18e^{3x} + 36x^2 - 1$
 $y^{(6)} = 54e^{3x} + 72x$

$f'(x) = 54e^{3x} + 72x$

5) Given the function $y = 2e^{3x-1}$, find $\frac{d^5y}{dx^5}$

$y = 2e^{3x-1}$
 $y' = 6e^{3x-1}$
 $y'' = 18e^{3x-1}$
 $y''' = 54e^{3x-1}$
 $y^{(4)} = 162e^{3x-1}$
 $y^{(5)} = 486e^{3x-1}$

$f'(x) = 486e^{3x-1}$

6) Given the function $y = 6 - 5x^3$, find $f^{(4)}(x)$

$y = 6 - 5x^3$
 $y' = -15x^2$
 $y'' = -30x$
 $y''' = -30$
 $y^{(4)} = 0$

$f'(x) = 0$

7) Given the function $y = \ln(\sin(x))$, find $\frac{d^2y}{dx^2}$

$y = \ln(\sin(x))$
 $y' = \frac{1}{\sin(x)} \cdot \cos(x) = \frac{\cos(x)}{\sin(x)} = \cot(x)$
 $y'' = -\csc^2(x)$

$f'(x) = -\csc^2(x)$

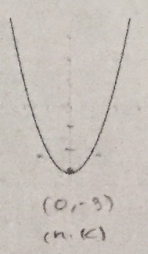
$u = 6x$
 $u' = 6$
 $y = \ln(x^4)$
 $y' = \frac{4}{x}$

8) Given the function $y = 6x \ln(x^4)$, find $\frac{d^2y}{dx^2}$

$y = 6x \ln(x^4)$
 $y' = 6x \left(\frac{4}{x}\right) + \ln(x^4)(6)$
 $y' = 24 + 6\ln(x^4)$
 $y'' = \frac{6}{x^4} \cdot 4x^3$
 $y'' = \frac{24x^3}{x^4} = \frac{24}{x}$

$f'(x) = \frac{24}{x}$

9) Given the graph of $f(x)$, sketch the graphs of $f'(x)$ and $f''(x)$ in distinct colors. $(x-h)^2 + k$



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

$f'(x) = 2x$

$f''(x) = 2$