

Math 2215 - Calculus 1

Quiz #5 - 2011.02.15

Solutions

Compute the following derivatives (you do not have to simplify):

1. $\frac{d}{dx} \frac{3x^2 - 4x + 1}{4x^3 - 6x + 2}$

We use the product rule here, where $f(x) = 3x^2 - 4x + 1$, $g(x) = 4x^3 - 6x + 2$. Note that $f'(x) = 6x - 4$ and $g'(x) = 12x^2 - 6$. Thus

$$\frac{d}{dx} \frac{3x^2 - 4x + 1}{4x^3 - 6x + 2} = \frac{(6x - 4)(4x^3 - 6x + 2) - (3x^2 - 4x + 1)(12x^2 - 6)}{(4x^3 - 6x + 2)^2}$$

2. $\frac{d}{dt} \sqrt{\frac{3t^2 - 4t + 1}{4t^3 - 6t + 2}}$

Notice that this is really the derivative of $\sqrt{h(t)}$, where $h(t)$ is the function from problem 1! What a coincidence eh? So

$$\frac{d}{dt} \sqrt{h(t)} = \frac{1}{2} \frac{1}{\sqrt{h(t)}} h'(t)$$

Plugging in the values from the previous problem, we have

$$\begin{aligned} \frac{d}{dt} \sqrt{\frac{3t^2 - 4t + 1}{4t^3 - 6t + 2}} &= \frac{1}{2} \frac{1}{\sqrt{\frac{3t^2 - 4t + 1}{4t^3 - 6t + 2}}} \cdot \frac{(6t - 4)(4t^3 - 6t + 2) - (3t^2 - 4t + 1)(12t^2 - 6)}{(4x^3 - 6x + 2)^2} \\ &= \frac{1}{2} \sqrt{\frac{4t^3 - 6t + 2}{3t^2 - 4t + 1}} \cdot \frac{(6t - 4)(4t^3 - 6t + 2) - (3t^2 - 4t + 1)(12t^2 - 6)}{(4x^3 - 6x + 2)^2} \end{aligned}$$