MA 16010: Applied Calculus 1 Quiz 5 (Solutions) Mon. Sept. 27, 2021

Please show **all** your work! Answers without supporting work will not be given credit. Write answers in spaces provided.

Name:_____

**(FOR BOTH PROBLEMS DON"T SIMPLIFY YOUR FINAL ANSWER!!!**

1. **[5pts]** Let $y = (3x-1)^{100}$. Find $y'$.

**Solution:**

Let $f(x) = x^{100}$ **[0.5pt]** and $g(x) = 3x - 1$ **[0.5pt]**
Then $f'(x) = 100x^{99}$ **[0.5pt]** and $g'(x) = 3$ **[0.5pt]**

By Chain Rule,

$$\begin{aligned} y' &= f'(g(x)) \cdot g'(x) && \textbf{[2pt]} \\ &= f'(3x-1) \cdot 3 \\ &= \boxed{100(3x-1)^{99} \cdot 3} && \textbf{[1pt]} \\ &= 300(3x-1)^{99} \end{aligned}$$

2. **[5pts]** Find the derivative $y = \sqrt{r^2 - 6x^2}$, where $r$ is a constant.

**Solution:** Notice $r$ is a constant so it's derivative is zero!

Let $f(x) = \sqrt{x} = x^{1/2}$ **[0.5pt]** and $g(x) = r^2 - 6x^2$ **[0.5pt]**

Then $f'(x) = \frac{1}{2}x^{-1/2}$ **[0.5pt]** and $g'(x) = -12x$ **[0.5pt]**

By Chain Rule,

$$\begin{aligned} y' &= f'(g(x)) \cdot g'(x) && \textbf{[2pt]} \\ &= f'(r^2 - 6x^2) \cdot (-12x) \\ &= \boxed{\frac{1}{2}(r^2 - 6x^2)^{-1/2} \cdot (-12x)} && \textbf{[1pt]} \\ &= \frac{-12x}{2(r^2 - 6x^2)^{1/2}} \\ &= \frac{-6x}{\sqrt{r^2 - 6x^2}} \end{aligned}$$