

Math U241, Fall 2007, Quiz #4

Solutions: _____

Compute

1. $\frac{d}{dv} (1-v)^{10}(1+2v)^5$

$$\begin{aligned} \frac{d}{dv} (1-v)^{10}(1+2v)^5 &\stackrel{\text{product rule}}{=} \left((1-v)^{10} \right)' (1+2v)^5 + (1-v)^{10} \left((1+2v)^5 \right)' \\ &= -10(1-v)^9(1+2v)^5 + 10(1-v)^{10}(1+2v)^4 \\ &= -10(1-v)^9(1+2v)^4 \left((1+2v) - (1-v) \right) \\ &= -10(1-v)^9(1+2v)^4 3v = \boxed{-30v(1-v)^9(1+2v)^4}. \end{aligned}$$

2. $\frac{d}{d\theta} 5^{\sin \pi \theta}$

$$\frac{d}{d\theta} 5^{\sin \pi \theta} = 5^{\sin \pi \theta} \cdot \ln 5 \cdot (\sin \pi \theta)' = 5^{\sin \pi \theta} \cdot \ln 5 \cdot \cos \pi \theta \cdot (\pi \theta)' = \boxed{\pi \cdot \ln 5 \cdot 5^{\sin \pi \theta} \cdot \cos \pi \theta}.$$

3. $(e^{\cot x} \cdot \sin^2 x)'$

$$\begin{aligned} (e^{\cot x} \cdot \sin^2 x)' &\stackrel{\text{product rule}}{=} e^{\cot x} \cdot (\cot x)' \cdot \sin^2 x + e^{\cot x} \cdot (\sin^2 x)' \\ &= e^{\cot x} \cdot \frac{-1}{\sin^2 x} \cdot \sin^2 x + e^{\cot x} \cdot 2 \sin x \cdot (\sin x)' \\ &= -e^{\cot x} + e^{\cot x} \cdot 2 \sin x \cdot \cos x = \boxed{e^{\cot x} \cdot (2 \sin x \cdot \cos x - 1)}. \end{aligned}$$