

Math 2315 - Calculus II

Quiz #1 - 2010.01.20

Solutions

1. Compute the following derivative:

$$\frac{d}{dt} (\sin(2t + 1) - \cos(1 - 2t))^2$$

$$\begin{aligned} \frac{d}{dt} (\sin(2t + 1) - \cos(1 - 2t))^2 &= 2 (\sin(2t + 1) - \cos(1 - 2t)) \frac{d}{dt} (\sin(2t + 1) - \cos(1 - 2t)) \\ &= 2 (\sin(2t + 1) - \cos(1 - 2t)) (2 \cos(2t + 1) - 2 \sin(1 - 2t)) \end{aligned}$$

2. Compute the following integral:

$$\int 4x \sqrt{1 + 8x^2} dx$$

We can solve this via substitution. Let $u = 1 + 8x^2$, then $du = 16x dx$, and solving for $4x dx$ gives $4x dx = \frac{1}{4} du$. Therefore,

$$\begin{aligned} \int 4x \sqrt{1 + 8x^2} dx &= \int \frac{1}{4} \sqrt{u} du \\ &= \int \frac{1}{4} \sqrt{u} du \\ &= \frac{1}{4} \int u^{\frac{1}{2}} du \\ &= \frac{1}{4} \frac{2}{3} u^{\frac{3}{2}} + c \\ &= \frac{1}{6} (1 + 8x^2)^{\frac{3}{2}} + c \end{aligned}$$