

Math 152 Quiz #7 Answers

1. Partial Fraction Decomposition: $\frac{t-9}{t^2-9} = \frac{2}{t+3} - \frac{1}{t-3}$

$$\begin{aligned}\Rightarrow \int_0^2 3 + \frac{t-9}{t^2-9} dt &= \int_0^2 \left(3 + \frac{2}{t+3} - \frac{1}{t-3}\right) dt = 3t + 2\ln|t+3| - \ln|t-3| \Big|_0^2 \\ &= 6 + 2\ln(5) - \ln(3)\end{aligned}$$

2. $\int \frac{1}{1+\sqrt[3]{x}} dx = \int \frac{3u^2}{1+u} du = \int 3u - 3 + \frac{3}{1+u} du$

$$= \frac{3}{2}u^2 - 3u + 3\ln|1+u| + C$$

$$= \frac{3}{2}x^{2/3} - 3\sqrt[3]{x} + 3\ln|1+\sqrt[3]{x}| + C$$

(Rationalizing substitution $u = \sqrt[3]{x} \Rightarrow u^3 = x \Rightarrow 3u^2 du = dx$, and then polynomial division to simplify the resulting rational function.)

3. $\int e^{2t} \cdot \sec^2(e^{2t}) dt = \frac{1}{2} \tan(e^{2t}) + C$ (Using subst. $u = e^{2t}$)