

Your Name: Key

Calculus I, Math 151-06, Quiz #10

1. [7 points] Evaluate $\frac{d}{dx} \int_{x^4}^3 \frac{\tan t}{t} dt$.

$$= \frac{d}{dx} - \int_3^{x^4} \frac{\tan t}{t} dt = - \frac{\tan(x^4)}{x^4} \cdot 4x^3$$

2. [6 points] Evaluate $\int_{-1}^3 (2x^2 - 3x + 1) dx$. Simplify your answer.

$$= \left[\frac{2}{3}x^3 - \frac{3}{2}x^2 + x \right]_{-1}^3$$

$$= \left[\frac{2}{3}(3)^3 - \frac{3}{2}(3)^2 + 3 \right] - \left[\frac{2}{3}(-1)^3 - \frac{3}{2}(-1)^2 + (-1) \right]$$

$$= \left[18 - \frac{27}{2} + 3 \right] - \left[-\frac{2}{3} - \frac{3}{2} - 1 \right]$$

$$= \left[\frac{15}{2} \right] - \left[-\frac{19}{6} \right] = \frac{64}{6} = \boxed{\frac{32}{3}}$$

3. [6 points] Evaluate $\int_1^e \left(\frac{3}{q} - \frac{3}{\sqrt{q}} \right) dq$. Simplify your answer.

$$\begin{aligned}
 &= \int_1^e \left(\frac{3}{q} - 3q^{-1/2} \right) dq = \left[3\ln|q| - 6\sqrt{q} \right]_1^e \\
 &= \left[3\ln e - 6\sqrt{e} \right] - \left[3\ln 1 - 6\sqrt{1} \right] \\
 &= 3 - 6\sqrt{e} - 0 + 6 = \boxed{9 - 6\sqrt{e}}
 \end{aligned}$$

4. [6 points] Evaluate $\int_{1/2}^1 \left(\frac{2}{\theta^2} + \frac{4}{\sqrt{1-\theta^2}} \right) d\theta$. Simplify your answer.

$$\begin{aligned}
 &= \left[-\frac{2}{\theta} + 4\arcsin \theta \right]_{1/2}^1 \\
 &= \left[-2 + 4\arcsin 1 \right] - \left[-4 + 4\arcsin \frac{1}{2} \right] \\
 &= -2 + 4\frac{\pi}{2} + 4 - 4\frac{\pi}{6} \\
 &= 2 + 2\pi - \frac{2\pi}{3} = \boxed{2 + \frac{4\pi}{3}}
 \end{aligned}$$