

Last Name: SOLUTIONS

First Name: _____

Student ID: _____

Quiz 3

Question 1. (10 marks) Evaluate the following integrals using the Fundamental Theorem of Calculus part 2 (Evaluation theorem). Simplify your answer as much as possible.

$$\begin{aligned}
 \text{(a)} \quad \int_0^1 x(\sqrt[3]{x} + \sqrt[4]{x}) dx &= \int_0^1 (x^{4/3} + x^{5/4}) dx \\
 &= \left[\frac{3}{7} x^{7/3} + \frac{4}{9} x^{9/4} \right]_0^1 = \\
 &= \left[\frac{3}{7} (1)^{7/3} + \frac{4}{9} (1)^{9/4} \right] - \left[\frac{3}{7} (0)^{7/3} + \frac{4}{9} (0)^{9/4} \right] \\
 &= \frac{3}{7} + \frac{4}{9} = \frac{55}{63}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad \int_{\pi/4}^{\pi/3} \sec \theta \tan \theta d\theta &= [\sec \theta]_{\pi/4}^{\pi/3} = \sec \frac{\pi}{3} - \sec \frac{\pi}{4} \\
 &= \frac{1}{\cos \frac{\pi}{3}} - \frac{1}{\cos \frac{\pi}{4}} = \frac{1}{1/2} - \frac{1}{\sqrt{2}/2} = 2 - \sqrt{2}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad \int_1^e \frac{x^2 + x + 1}{x} dx &= \int_1^e \left(x + 1 + \frac{1}{x} \right) dx \\
 &= \left[\frac{x^2}{2} + x + \ln|x| \right]_1^e = \left[\frac{e^2}{2} + e + \ln e \right] - \left[\frac{1^2}{2} + 1 + \ln 1 \right] \\
 &= \frac{e^2}{2} + e + 1 - \frac{1}{2} - 1 - 0 = \frac{e^2}{2} + e - \frac{1}{2}
 \end{aligned}$$