

Last Name: SOLUTIONS

First Name: \_\_\_\_\_

Student ID: \_\_\_\_\_

## Quiz 4

Question 1. Evaluate the following (make sure to clearly show all of your work):

$$(a) (3 \text{ marks}) \int_0^{\pi/3} \frac{\sin \theta + \sin \theta \tan^2 \theta}{\sec^2 \theta} d\theta = \int_0^{\pi/3} \frac{\sin \theta (1 + \tan^2 \theta)}{\sec^2 \theta} d\theta$$

$$= \int_0^{\pi/3} \frac{\sin \theta \sec^2 \theta}{\sec^2 \theta} d\theta = \int_0^{\pi/3} \sin \theta d\theta = [-\cos \theta]_0^{\pi/3}$$

$$= -\cos \pi/3 - (-\cos 0) = -\frac{1}{2} - (-1) = \frac{1}{2}$$

$$(b) (3 \text{ marks}) \int_{-1}^1 e^{u+1} du = \int_{-1}^1 e^u \cdot e' du = e \int_{-1}^1 e^u du$$

$$= e \cdot [e^u]_{-1}^1 = e(e^1 - e^{-1}) = e^2 - 1$$

$$(c) (4 \text{ marks}) \frac{d}{dx} \left[ \int_{\sin x}^1 \sqrt{1+t^2} dt \right] = \frac{d}{dx} \left[ - \int_1^{\sin x} \sqrt{1+t^2} dt \right]$$

$$= - \frac{d}{dx} \left[ \int_1^{\sin x} \sqrt{1+t^2} dt \right] = \text{D}$$

$$\text{LET } g(x) = \int_1^x \sqrt{1+t^2} dt \quad \text{Then BY FTC I } g'(x) = \sqrt{1+x^2}$$

$$\therefore \text{D} = - \frac{d}{dx} [g(\sin x)] = -g'(\sin x) \cdot \frac{d}{dx} [\sin x]$$

$$= -(\sqrt{1+\sin^2 x}) \cdot \cos x$$