

Name: Solution Key

Panther ID: _____

Quiz 3

Calculus I - Spring 13

To receive credit you MUST SHOW ALL YOUR WORK.

1. (4 pts) Solve the initial value problem:

$$\frac{dy}{dx} = \frac{3}{2x} + x^2 - 1, \quad y(1) = \frac{1}{3}$$

$$y(x) = \int \left(\frac{3}{2} \cdot \frac{1}{x} + x^2 - 1 \right) dx = \frac{3}{2} \ln|x| + \frac{1}{3} x^3 - x + C$$

$$\frac{1}{3} = \frac{3}{2} \ln 1 + \frac{1}{3} - 1 + C \Rightarrow C = 1$$

$$\text{so } y(x) = \frac{3}{2} \ln|x| + \frac{1}{3} x^3 - x + 1$$

2. Compute (~~3 pts~~ each)

(b) $\int \frac{\cos(3/x)}{x^2} dx = *$

(3pts) sub. $u = \frac{3}{x}$

$$du = -\frac{3}{x^2} dx$$

$$\text{so } -\frac{1}{3} du = \frac{1}{x^2} dx$$

$$* = \int \cos(u) \cdot \left(\frac{1}{3}\right) du$$

$$= -\frac{1}{3} \int \cos(u) du = -\frac{1}{3} \sin(u) + C$$

$$= -\frac{1}{3} \sin\left(\frac{3}{x}\right) + C$$

(c) $\int \frac{\sec^2 x}{\sqrt{1 - \tan^2 x}} dx =$

(3pts) sub $u = \tan x$

$$du = \sec^2 x dx$$

$$= \int \frac{du}{\sqrt{1-u^2}} = \int \frac{1}{\sqrt{1-u^2}} du$$

$$= \arcsin(u) + C$$

$$= \arcsin(\tan x) + C$$

2(a) $\int (\sqrt{x} + e^x - \sec x \tan x) dx = \int (x^{\frac{1}{2}} + e^x - \sec x \tan x) dx$

$$= \frac{2}{3} x^{\frac{3}{2}} + e^x - \sec x + C$$