**Quiz 4** MAC-2311 Fall 2015 **Name:** Solution Key

**To receive credit you MUST SHOW ALL YOUR WORK.**

**1.** (3 pts) Solve the initial value problem:

$$\frac{dy}{dx} = 5e^x - 3\sqrt{x}\,, \quad y(0) = 0$$

$$y(x) = \int (5e^x - 3\sqrt{x})\,dx = \int (5e^x - 3x^{\frac{1}{2}})\,dx = 5e^x - \cancel{3}\cdot\frac{2}{\cancel{3}}x^{\frac{3}{2}} + c$$

$$y(0) = 0 \Rightarrow 0 = 5e^0 - 2\cdot 0^{\frac{3}{2}} + c \Rightarrow 0 = 5 + c \Rightarrow c = -5$$

Thus $\boxed{y(x) = 5e^x - 2x^{\frac{3}{2}} - 5}$

**2.** (9 pts) Evaluate each integral:

(a) $\int \left(\frac{1}{3x} - \frac{2}{\sqrt{1-x^2}} + \pi^2\right) dx = \int \left(\frac{1}{3}\cdot\frac{1}{x} - \frac{2}{\sqrt{1-x^2}} + \pi^2\right) dx$

$$= \boxed{\frac{1}{3}\ln|x| - 2\arcsin(x) + \pi^2\cdot x + c}$$

(b) $\int \frac{\sec^2(2/x)}{x^2}\,dx =$

Sub: $u = \frac{2}{x}$

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

$-\frac{1}{2}\,du = \frac{1}{x^2}\,dx$

$$= \int \sec^2(u)\cdot\left(-\frac{1}{2}\,du\right) = -\frac{1}{2}\int \sec^2(u)\,du$$

$$= -\frac{1}{2}\tan(u) + c = \boxed{-\frac{1}{2}\tan\left(\frac{2}{x}\right) + c}$$

(c) $\int \left(1+3\cos x\right)^5 \sin x\,dx =$

$u = 1 + 3\cos x$

$du = -3\sin x\,dx$

$-\frac{1}{3}\,du = \sin x\cdot dx$

$$= \int u^5\cdot\left(-\frac{1}{3}\right)du$$

$$= -\frac{1}{3}\cdot\frac{u^6}{6} + c$$

$$= \boxed{-\frac{1}{18}(1+3\cos x)^6 + c}$$