Math 274 Quiz 4 Name: ____________

3 July 2017 Show Appropriate Work Point Values in $\boxed{\text{boxes}}$.

1. Use appropriate substitutions to find the explicit general solution for the following.

(a) $\boxed{4}$ $\dfrac{dy}{dx} + \dfrac{y}{2} = \dfrac{x}{y}$ so $y\dfrac{dy}{dx} + \dfrac{1}{2}y^2 = x$ Bernoulli:

Let $v = y^2$ so $\dfrac{dv}{dx} = 2y\dfrac{dy}{dx}$.

$$\frac{1}{2}\frac{dv}{dx} + \frac{1}{2}v = x$$

$$\frac{dv}{dx} + v = 2x \qquad \mu(x) = e^{\int dx} = e^x$$

so $v = e^{-x}\displaystyle\int 2x\, e^x\, dx = e^{-x}\left[2xe^x - 2e^x + C\right] = 2x - 2 + Ce^{-x}$

$u = 2x$ $dv = e^x\,dx$

$du = 2dx$ $v = e^x$

Finally, $y = \pm\sqrt{2x - 2 + Ce^{-x}}$

(b) $\boxed{4}$ $\dfrac{dy}{dx} = \sqrt{2x+y} - 2$ Let $v = 2x + y$

so $\dfrac{dv}{dx} = 2 + \dfrac{dy}{dx}$.

$$\frac{dv}{dx} = \sqrt{v}$$

$$\int \frac{dv}{\sqrt{v}} = \int dx$$

so $2\sqrt{v} = x + C$

$$v = \left(\frac{x+C}{2}\right)^2$$

$$y = \left(\frac{x+C}{2}\right)^2 - 2x$$

2. In one of the two equations above it is likely that you lost a solution. For which equation did you lose a solution and what is the lost solution?

in (b) we lost the solution $v = 0$, i.e. $2x + y = 0$

or $y = -2x$