

## Quiz 1 Form B

January 28, 2011

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Instructions: Give concise answers, but clearly indicate your reasoning. Most of the problems have rather short answers, so if you find yourself involved in a lengthy calculation, it might be a good idea to move on and come back to that problem if you have time.

- I.** Find infinitely many solutions of the differential equation  $7y' = 5y$ . Start by looking for a solution of the form  $y = e^{rx}$ , where  $r$  is a certain constant.  
(3)
- II.** What basic types of mathematical objects (more basic than “integral”) appear on the two sides of this well-known equation:  $\int \cos(x) dx = \sin(x) + C$ ?  
(2)
- III.** (a) Solve the initial value problem  $\frac{dy}{dx} = \frac{1}{x^2}$ ,  $y(2) = 0$ .  
(5)  
(b) Apply the Existence and Uniqueness Theorem to this initial value problem (that is, verify that this initial value problem satisfies the hypotheses of the theorem). What does the theorem tell you about the solution you have found?
- IV.** Tell two well-known basic functions that are solutions of  $y'' = -y$ .  
(2)
- V.** The separable differential equation  $\frac{dy}{dx} = \frac{x}{y^2}$  can be written as  $y^2 dy = x dx$ . Integrate both sides of this and solve for  $y$  to find the general solution.  
(3)