Separable Differential Equations- HW Problems

In problems 1-4 find the general solution to the differential equations.

1. $\frac{dy}{dx} = \frac{x^2}{y^2}$
2. $\frac{dy}{dx} = 3y$
3. $\frac{dy}{dx} - \sqrt{4xy} = 0$
4. $\frac{dy}{dx} - (1+x)(1+y) = 0.$

In problems 5-8 find the particular solution to the differential equation.

5. $\frac{dy}{dx} = \frac{2x+3x^2}{3y^2}$; $y(1) = 2$
6. $\frac{dy}{dx} - 2e^{(x+2y)} = 0$; $y(0) = 1$
7. $\frac{dy}{dx} + 3x^2y^2 + 2xy^2 = 0$; $y(1) = 3$
8. $\frac{dy}{dx} = 3x^2(y^2+1)$; $y(0) = 1$

9. A population of bacteria grows at a rate proportional to the size of the existing population. Suppose that the population grows to 10 times its original size in 24 hours. How long did it take for the population to double?

10. Suppose you invest $\$10{,}000$ in an account that grows at a rate of 4% per year compounded continuously.

a. How long does it take for the investment to double its original amount?

b. How much money will be in the account after 10 years?

11. A turkey is heated in an oven to $200°F$. At time $t = 0$ it is taken out of the oven and put on a counter in a room whose temperature is $70°F$. After 20 minutes the turkey's temperature is $150°F$. At what time will the turkey's temperature be $125°F$?