6.3 Differential Equations - Separation of Variables

Name: Date: August 9, 2015

P 2. Find the general solution of the differential equation.

$$\frac{dy}{dx} = \frac{3x^2}{y^2}$$

P 4. Find the general solution of the differential equation.

$$\frac{dy}{dx} = \frac{6 - x^2}{2y^3}$$

P 12. Find the general solution of the differential equation.

$$\sqrt{x^2 - 16}y' = 11x$$

P 16. Find the particular solution that satisfies the initial condition $y(1) = 9$.

$$\sqrt{x} + \sqrt{y}y' = 0$$

P 18. Find the particular solution that satisfies the initial condition $y(1) = 2$.

$$2xy' - \ln x^2 = 0$$

P 20. Find the particular solution that satisfies the initial condition $y(0) = 1$.

$$y\sqrt{1 - x^2}y' - x\sqrt{1 - y^2} = 0$$

P 22. Find the particular solution that satisfies the initial condition $r(0) = 0$.

$$\frac{dr}{ds} = e^{r-2s}$$

P 26. Find an equation of the graph that passes through the point $(1, 1)$ and has slope $y' = -9x/(16y)$.

P 65. A 100-gallon tank is full of a solution containing 25 pounds of a concentrate. Starting at time $t = 0$, distilled water is admitted to the tank at a rate of 5 gallons per minute, and the well-stirred solution is withdrawn at the same rate.

(a) Find the amount Q of the concentrate in the solution as a function of t.

(b) Find the time when the amount of concentrate in the tank reaches 15 pounds.

P 69. A wet towel hung from a clothesline to dry loses moisture through evaporation at a rate proportional to its moisture content. After 1 hour, the towel lost 40 % of its original moisture content. After how long will it have lost 80 %?

P 71. When predicting population growth, demographers must consider birth and death rates as well as the net change caused by the difference between the rates of immigration and emigration. Let P be the population at time t and let N be the net increase per unit time due to the difference between immigration and emigration. The rate of growth of the population is given by

$$\frac{dP}{dt} = kP + N,$$

where N is a constant. Find P as a function of t.