

Problems for Section 9.1

- (1) Show that $y = 2x + \frac{1}{x^2}$ is a solution of the differential equation $x^3y' = x^2y - 3$.

Problems for Section 9.2

- (1) Sketch a direction field for the differential equation $y' = -\frac{x}{y}$. Sketch two different solution curves.

Problems for Section 9.3

- (1) Find the general solution of the differential equation $y' = -\frac{x}{y}$. This is the differential equation in problem (1) of section 9.2.

- (2) Find the solution of the differential equation $\frac{dy}{dx} = x^2y^2$ with initial condition $y(1) = 9$.

- (3) Find the solution of the differential equation $\frac{dy}{dx} = x(1 + y^2)$ with initial condition $y(0) = 1$.

- (4) Find the solution of the differential equation $\frac{du}{dt} = tu$ with initial condition $u(1) = 3$.

Problems for Section 9.4

- (1) A bacterial culture weighs 2 grams at noon. It weighs 5 grams at 2:00 pm. How much does it weigh at 3:00 pm?

- (2) A population increases exponentially. It doubles every 10 years. How long does it take for this population to triple in size?

- (3) Carbon 14 has a half-life of 5730 years. We have a 5 gram sample of carbon 14 in the year 2007. How many grams of it will be left in the year 2107 ?

- (4) A 7 gram sample of an isotope was placed in storage in the year 1958. In the year 2007 there were only 5 grams left in this sample. What is the half-life of this isotope?

- (5) A warm drink has a temperature of 40° C when it is placed on a table in a 25° C room. The drink's temperature is 35° C 10 minutes later. How many more minutes does it take for the drink's temperature to reach 30° C ?

- (6) What interest rate is required for an investment to double every 8 years? Give the answer as a percentage with 3 significant digits.