6-3 Worksheet

1. Solve the differential equation $\dfrac{dy}{dx} = \sqrt{xy}$.

2. Solve the differential equation $y \ln x - xy' = 0$.

3. Find the particular solution of the differential equation $\dfrac{du}{dv} = uv \sin v^2$, $u(0) = 1$.

4. Find the orthogonal trajectories of the family $y = Ce^x$.

5. Find the orthogonal trajectories of the family $x^2 = Cy$.

6. Verify that $y = \dfrac{L}{1 + be^{-kt}}$ satisfies the logistic differential equation $\dfrac{dy}{dt} = ky\left(1 - \dfrac{y}{L}\right)$.

7. Solve the logistic differential equation $\dfrac{dy}{dt} = y\left(1 - \dfrac{y}{36}\right)$, $y(0) = 4$.

8. Solve the logistic differential equation $\dfrac{dy}{dt} = \dfrac{4y}{5} - \dfrac{y^2}{150}$, $y(0) = 8$.

9. At time $t = 0$, a bacterial culture weighs 1 gram. Two hours later, the culture weighs 4 grams. The maximum weight of the culture is 20 grams. Write a logistic equation that models the weight of the bacterial culture. Then, use your model to find the weight after 5 hours.

10. Write the differential equation that models the following verbal statement: The rate of change of y with respect to x is proportional to the difference between y and 4.