

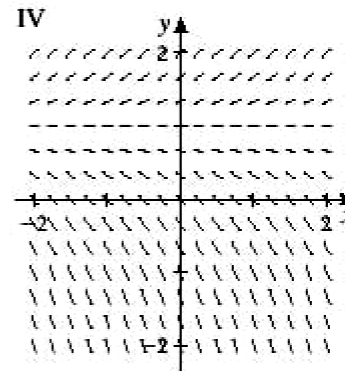
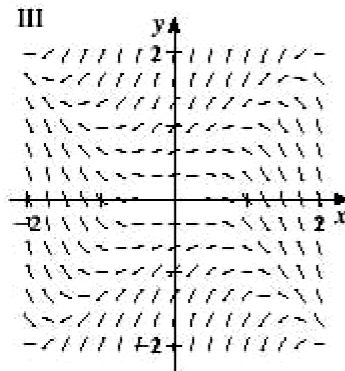
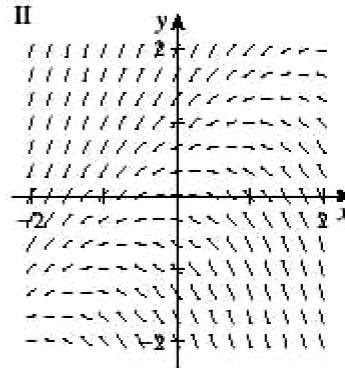
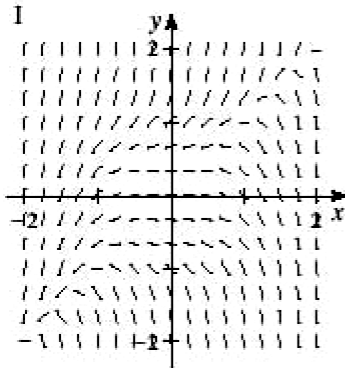
1. For what values of r does the function $y = e^{rt}$ satisfy the differential equation

$$y'' + y' - 20y = 0?$$

2. For what nonzero values of k does the function $y = \sin(kt)$ satisfy $y'' + 4y = 0$?

3. Solve the differential equation $5yy' = 3x$.

4. Select a direction field for the differential equation $y' = y^2 - x^2$ from a set of direction fields labeled I-IV.



5. The functions $y = Ce^{2x^2}$ (for any constant C) are solutions of the differential equation $y' = 4xy$. Find the solution that satisfies the initial condition $y(1) = 1$.

6. Solve the differential equation $y' = \frac{7x^6 y}{\ln y}$

7. Solve the initial-value problem $x^2 \frac{dy}{dx} + 2xy = -\sin x$, given that $y(\pi) = 0$.

8. Solve the initial value problem $\frac{dr}{dt} + 2tr = r$, given that $r(0) = 10$.

Bonus – Solve the logistic equation $\frac{dp}{dt} = 0.1p\left(1 - \frac{p}{2000}\right)$, given $p(0) = 100$. (Hint: This equation is separable, and its solution involves partial fractions.)