In Exercises 1–3, find the general solution (in scalar form) of the given second-order equation.

1. $\dfrac{d^2y}{dt^2} + 3\dfrac{dy}{dt} - 10y = 0$

2. $\dfrac{d^2y}{dt^2} + 6\dfrac{dy}{dt} + 9y = 0$

3. $\dfrac{d^2y}{dt^2} + 8\dfrac{dy}{dt} + 25y = 0$

In Exercises 4–6, find the solution of the given initial-value problem.

4. $\dfrac{d^2y}{dt^2} + 5\dfrac{dy}{dt} + 6y = 0$
$y(0) = 0, y'(0) = 2$

5. $\dfrac{d^2y}{dt^2} + 2\dfrac{dy}{dt} + 5y = 0$
$y(0) = 3, y'(0) = -1$

6. $\dfrac{d^2y}{dt^2} + 2\dfrac{dy}{dt} + y = 0$
$y(0) = 1, y'(0) = 1$

7. A 4 kg mass is suspended from a spring in a liquid that offers a resistance force whose magnitude is eight times the velocity of the mass.

(a) Find all spring constants for which the mass will not oscillate once it is placed into motion.

(b) Does decreasing the magnitude of the spring constant cause the mass to oscillate slower or faster?

8. A mass of 3 kg is attached to the end of a spring that is stretched 20 cm by a force of 15 N. It is set in motion with initial position $x_0 = 0$ and initial velocity $v_0 = -10$ m/s. Find the amplitude, period, and angular frequency of the resulting motion.