Name: _____

Population models, springs, general differential equations.

1. A population model is defined by the differential equation:

$$\frac{dP}{dt} = 1.2P(1 - \frac{P}{4200}).$$

(a) For what values of P is the population increasing;
(b) For what values of P is the population decreasing;
(c) What are the equilibrium solutions.

2.
(a) For what values of k does the function $y = \cos kx$ satisfy the differential equation $4y'' = -25y$?
(b) For those values of k, verify that every member of the family of functions $y = A\sin kt + B\cos kt$ is also a solution.

3. A function $y(t)$ satisfies the differential equation:

$$\frac{dy}{dt} = y^4 - 6y^3 + 5y^2.$$

(a) What are the constant solutions of the equation?
(b) For what values of y is y increasing?
(c) For what values of y is y decreasing?