HW3
SECTION 2.5

① Given $\begin{cases} \frac{dy}{dt} = f(y) = y(y-1)(y-2) & , y_0 \geq 0 \\ y(0) = y_0 & , t > 0 \end{cases}$

Sketch graph of $f(y)$ versus y
Determine the critical (equilibrium) pts
Classify equilibrium pts as either asymptotically stable or unstable or semistable
Draw the phase line and several graphs of solutions in the t-y plane.

② Given $\begin{cases} \frac{dy}{dt} = y^2(4-y^2) & , t > 0 \\ y(0) = y_0 & , -\infty \leq y_0 \leq \infty \end{cases}$

Same questions as in ①.

③ Solve the Gompertz Equation:

$$\frac{dy}{dt} = ry \ln(K/y)$$

subject to initial condition $y(0) = y_0$

Hint: let $u = \ln(y/K)$

(b) For data given in Example 1 in the text ($r = 0.71$ per year, $K = 80.5 \times 10^6$ kg, $y_0/K = 0.25$) use the Gompertz Equation to find the predicted value of $y(2)$

(c) For the same data in part (b), use the Gompertz Model to find the time $\bar{t}$ at which $y(\bar{t}) = 0.75K$.

SECTION 2.6

(4) Determine whether

$$(2x+3) + (2y-2)y' = 0$$

is exact. If exact, find solution

(5) Same question for

$$\left(\frac{y}{x} + 6x\right)dx + (\ln x - 2)dy = 0, \quad x > 0$$

(6) Find the value of b for which the equation

$$(ye^{2xy} + x)dx + bxe^{2xy}dy = 0$$

is exact and then solve equation given this value of b.