MAT 239 (Differential Equations), Prof. Swift
Exam 1 Review

1. Put a "Y" or "N" in the blank, indicating if the ODE has the indicated property. Use the differential form to test exactness. Also, decide how you would find the general solution most easily, or decide that you should punt on this one.

___ Separable

___ Linear $\frac{dy}{dx} = 3x^2y + x$ or $(3x^2y + x)dx - dy = 0.$

___ Exact

___ Separable

___ Linear $\frac{dy}{dx} = x^2 - y^2$ or $(y^2 - x^2)dx + dy = 0.$

___ Exact

___ Separable

___ Linear $\frac{dy}{dx} = -\frac{x^2 + 2xy + y^2}{x^2 + 2xy}$ or $(x^2 + 2xy + y^2)dx + (x^2 + 2xy)dy = 0.$

___ Exact

2. Solve the IVP $\frac{dy}{dt} = y^2, \quad y(0) = y_0$, where y_0 is a positive constant. Find the interval of existence of the solution, and sketch the solution.