MATH 263: Section 003, Tutorial 2 Extra Problems

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Problem 1. Solve the following autonomous equation:

$$y' = y^2 + y$$

with initial value condition $y(0) = 1$.

Problem 2. Find the general solution of:

$$y' + 2xy = 2x\ e^{-x^2}$$

Problem 3. Solve the initial value problem:

$$4xy\ \frac{dy}{dx} = x^2 + 4y^2$$

for $y(1) = 2$.

Problem 4. Consider the general Bernoulli equation:

$$y' + P(x)y = Q(x)y^n$$

Using the substitution $v = y^{1-n}$, find the equivalent linear differential equation for v. Note: You do **not** have to solve the equation for v.

Problem 5. Find the general solution of:

$$y'' = x^2 + 2xy' + (y')^2$$

Hint: Use the substitution $v(x) = x + y'(x)$.