1. Solve following initial value problem (you can leave solution in implicit form).
\[
\frac{dy}{dx} = \frac{y^2}{x^2 + xy}, \quad y(1) = 1.
\]

2. (a) Prove that by introducing new variable \( u = xy \), equation
\[
\frac{x}{y} \frac{dy}{dx} = f(xy)
\]
becomes a separable equation with unknown \( u \), where \( f \) is a continuous function.
(b) Use part (a) to solve ODE
\[
y(1 + x^2 y^2)dx = xdy.
\]

3. Problem 5, 6, 15 of Section 2.4.

4. Problem 6, 11, 12 of Section 2.5.

5. Problem 1-4, 13, 14, 23, 25, 26 of Section 2.6.

6. Solve following Bernoulli equations:
   (a) \( \frac{dy}{dx} + xy = x^3 y^3; \)
   (b) \( t^2 y' + 2ty - y^3 = 0, \ t > 0. \)

7. Use the forward Euler method with 4 intermediate steps (i.e. \( n = 4 \)) to approximate the solution of
\[
P'(t) = P(t), P(0) = 1,
\]
up to time \( T = 1. \)

8. Problem 1 - 6 of Section 2.9.

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*Due Date: Wed. 7/6.
†Problem 3, 4, 5, 8 are based on Elementary Differential Equations and Boundary Value Problems, 9th/10th Edition, by Boyce and DiPrima.