# 2022 Differential Equation Quiz 3 (Written quiz)

1 Solve each of the following initial value problems and plot the solutions for several values of $y_0$

$$(1) \quad \frac{dy}{dt} = -y + 5 \quad , y(0) = y_0 (20 points)$$

2 Verify that each given function is a solution of the differential equation. (20 points)

$$2t^2y'' + 3ty' - y = 0, \quad t > 0; \quad y_1(t) = t^{1/2}, \quad y_2(t) = t^{-1}$$

3 Determine the values of $r$ for which the given differential equation has solutions of the form y = $e^{rt}$. Write the general solution along with variable $A$ as the arbitrary constant. (20 points)

$$y' + 2y = 0$$

4 Find the general solution of the given differential equations, and use it to determine how solutions behave as $t \to \infty$. Use integrating factor method.(5 points and 15 points respectively)

$$(1) \quad y' - 2y = t^2e^{2t}$$
$$(2) \quad 2y' + y = 3t^2$$

5 Find the solution of the given initial value problem in explicit form and determine (at least approximately) the interval in which the solution is defined. (20 points)

$$y' = \frac{2x}{1 + 2y}, \quad y(2) = 0$$