Some practice problems

(1) Every solution to the second order ODE $y'' + y = 0$ is periodic. (That is, there is some number $T > 0$ such that $y(t+T) = y(t)$ for all t.)

a. True

b. False

(2) The functions $y_1 = e^t$ and $y_2 = t^2$ can solve the same second order ODE of the form $y'' + p(t)y' + q(t)y = 0$ on the interval $(-1, 1)$.

a. True

b. False

(3) The functions $y_1 = e^t$ and $y_2 = te^{-2t}$ can solve the same second order ODE of the form $y'' + p(t)y' + q(t)y = 0$ on the interval $(-1, 1)$.

a. True

b. False

(4) The function $c_1e^{-2t} + c_2te^{-2t}$ is a general solution of the ODE

a. $y'' + 2y' + y = 0$

b. $y'' + 4y' + 4y = 0$

c. $y'' + 3y' + 2y = 0$

d. $y'' + 4y' + 4y = t$

(5) Find an ODE for which $y_1 = e^{2t}\cos(3t)$ and $y_2 = e^{2t}\sin(3t)$ are solutions.

(6) Find an ODE for which $y_1 = \cos(2t) + 3\sin(2t)$ and $y_2 = -\cos(2t) + \sin(2t)$ are solutions.

(7) Find an ODE for which $y_1 = e^{-2t}$ and $y_2 = (t+3)e^{-2t}$ are solutions.

(8) Solve the initial value problem $y'' + 5y' + 4y = 0$, $y(0) = 1$, $y'(0) = -1$.

(9) Solve the initial value problem $y'' + 4y' + 4y = 0$, $y(0) = 1$, $y'(0) = -1$.

(10) Solve the initial value problem $y'' + 2y' + 4y = 0$, $y(0) = 1$, $y'(0) = -1$.