Readiness Assurance Test

Choose the most appropriate response for each question.

21) Solve the system

$$2x - 3y = 7$$
$$3x + 4y = 2$$

(a) $x = -1,\ y = 3$ (b) $x = -2,\ y = -1$ (c) $x = 3,\ y = 1$ (d) $x = 2,\ y = -1$

22) Solve the system

$$tx + 2y = t^3 + 2t$$
$$x + ty = 2t^2$$

(a) $x = t + 1,\ y = t - 1$ (b) $x = t + 1,\ y = t^2$ (c) $x = t,\ y = t^2 - 1$ (d) $x = t^2,\ y = t$

23) Solve

$$y'' + 8y' + 20y = 0.$$

(a) $y = c_1 e^{-4t}\cos(2t) + c_2 e^{-4t}\sin(2t)$
(b) $y = c_1 e^{4t}\cos(4t) + c_2 e^{4t}\sin(4t)$
(c) $y = c_1 e^{-10t} + c_2 e^{2t}$
(d) $y = c_1 e^{10t} + c_2 e^{-2t}$

24) Solve

$$y'' + 8y' - 20y = 0.$$

(a) $y = c_1 e^{-4t}\cos(2t) + c_2 e^{-4t}\sin(2t)$
(b) $y = c_1 e^{4t}\cos(4t) + c_2 e^{4t}\sin(4t)$
(c) $y = c_1 e^{-10t} + c_2 e^{2t}$
(d) $y = c_1 e^{10t} + c_2 e^{-2t}$

25) Solve

$$y'' + 8y' + 16y = 0.$$

(a) $y = c_1 e^{-4t} + c_2 e^{4t}$
(b) $y = c_1 e^{-4t} + c_2 t e^{-4t}$
(c) $y = c_1 e^{-4t}\cos(2t) + c_2 e^{-4t}\sin(2t)$
(d) $y = c_1 e^{4t}\cos(4t) + c_2 e^{4t}\sin(4t)$

26) Which of the following ODEs models the displacement of an **undamped** spring-mass sytem?

(a) $x'' - 4x = 0$ (b) $x'' + 4x = 0$ (c) $x'' + 4x' + 4x = 0$ (d) $x'' - 4x' + 4x = 0$

27) Which of the following ODEs models the displacement of a **damped** spring-mass sytem?

(a) $x'' - 4x' + 4x = 0$ (b) $x'' + 4x' + 4x = 0$ (c) $x'' - 4x' = 0$ (d) $x'' + 4x' = 0$

28) How many sinks (i.e. stable equillibria) does the autonomous ODE below have?

$$y' = (y-2)(y-1)^2 y(y+1)^3(y+2)$$

(a) 0 (b) 1 (c) 2 (d) 3

29) If y is a solution to the below IVP, compute $\lim_{t\to\infty} y(t)$.

$$y' = (y-2)(y-1)^2 y(y+1)^3(y+2) \qquad y(3) = -0.5$$

(a) -2 (b) -1 (c) 0 (d) 1

30) Find the general solution to

$$y'' + y = 1.$$

(a) $y = c_1\cos(t) + c_2\sin(t) + 1$
(b) $y = c_1\cos(t) + c_2\sin(t) + \sin(t)\cos(t)$
(c) $y = c_1e^t + c_2e^{-t} + \sin(t)\cos(t)$
(d) $y = c_1e^t + c_2te^t + 1$