Quiz. Section D03

problem 1 $(t-6)\,y' + (\ln t)\,y = 9(t)$, $y(1) = 9$

$$y' + \frac{(\ln t)}{t-6}\,y = \frac{9t}{t-6}$$

$p(t) = \dfrac{\ln t}{t-6}$ $\quad q(t) = \dfrac{9t}{t-6}$ } 1 pt for identifying $p(t), q(t)$

$p(t)$ is defined for $t > 0$

Critical points are $t = 0, 6$ } 2 pts finding critical points

Initial value lies in 0 to 6. } 1 pt

$\therefore$ Initial value problem exist in $0 < t < 6$ } 1 pt

problem 2: $y' = \dfrac{4x^3+2x+1}{y-1}$, $y(0) = 0$

$(y-1)\,dy = (4x^3+2x+1)\,dx$ } 2pts for solving the diff. eq.

$\dfrac{y^2}{2} - y = x^4 + x^2 + x + C$

$0 - 0 = 0 + 0 + 0 + C$

$\Rightarrow C = 0$ } 1 pt for finding value of C

$\dfrac{y^2}{2} - y = x^4 + x^2 + x$ } 1pt for correct answer

$\left(y - \frac{1}{2}\right)^2 = 2(x^4 + x^2 + x) + 1$

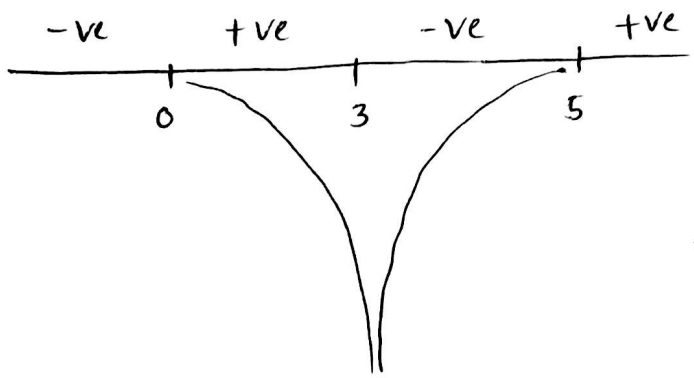
$y = \frac{1}{2} \pm \sqrt{2(x^4+x^2+x)+1}$

$y = \frac{1}{2} - \sqrt{2x^4+2x^2+2x+1}$ } 1pt for writing the solution in explicit form

Quiz 1, Section D05

problem 1

$$\frac{dy}{dt} = y(y-3)(y-5), \quad y_0 \geq 0$$



} 2 pts for identifying critical pts and marking signs

$y = 0$ unstable
$y = 3$ stable
$y = 5$ unstable

} 3pts for marking critical points correctly

problem 2:

$$t^2 y' + ty = 2$$

$$y' + \frac{1}{t} y = \frac{2}{t^2}$$

$$\text{I.F.} = e^{\int \frac{1}{t} dt} = e^{\ln t} = t$$

} 2 pts for finding I.F.

$$yt = \int \frac{2}{t^2} \times t \, dt$$

$$= 2 \ln|t| + C$$

} 3pts for solving