MATH 341 – QUIZ # 2 SOLUTIONS

(1)

$$\begin{aligned} y_0(t) &= y(0) = 1 \\ y_1(t) &= 1 + \int_0^t (s^2+1)ds \\ &= t^3/3 + t + 1 \end{aligned}$$

(2) (a) Separate variables:

$$\begin{aligned} \frac{2yy'}{1+y^2} &= -t^2 \\ \log(1+y^2) &= -t^3/3 + C \\ y^2 &= Ce^{-t^3/3} - 1 \end{aligned}$$

The initial condition implies $C = 2$, so $y = (2e^{-t^3/3} - 1)^{1/2}$. For (b), set $\phi_t = 2ty^3$, $\phi_y = 3t^2y^2$. We see that $\phi = t^2y^3$, and $\phi = C$ is a solution. The initial condition means $C = 1$, so $y = t^{-2/3}$.

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