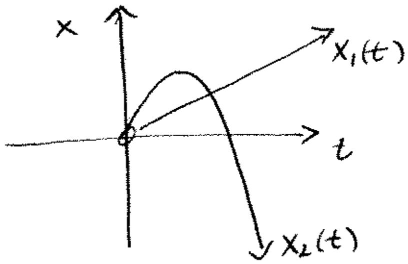

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Math 2150, Fall 2006, Quiz 11

29 November 2006

1. Explain why the two curves shown above cannot be solutions to a 1st order differential equation with continuous coefficients.

2. Find the Laplace transform Y of the solution to the differential equation

$$y'' + 4y' + 13y = 1, \qquad y(0) = 1, \qquad y'(0) = -1.$$

1. The uniqueness of solutions would be violated at the intersection of the two curves.

2. Let $Y = \mathcal{L}\{y\}$. Then

(2) $$\mathcal{L}\{y'\} = sY - y(0) = sY - 1$$

(2) $$\mathcal{L}\{y''\} = s(sY - 1) - y'(0) = s^2Y - s + 1$$

The transformed equation is then

(3) $$s^2Y - s + 1 + 4(sY - 1) + 13Y = \frac{1}{s}$$

or $$(s^2 + 4s + 13)Y = \frac{1}{s} + s - 1 + 4 = \frac{1}{s} + s + 3$$

3) so $$Y = \frac{1}{s(s^2+4s+13)} + \frac{s+3}{s^2+4s+13}$$