Math 274 28 Mar 2018 Quiz 6 Show Appropriate Work Name: _______ Point Values in boxes.

1. Assume g(t) is piecewise continuous and of exponential order and consider the initial value problem

$$y'' + 2y' + y = g(t),$$
 $y(0) = 1, y'(0) = 2.$

(a) $\boxed{4}$ Find the solution. Express your solution in terms of a convolution.

(b) 1 Express the convolution in part (a) as an appropriate integral.

2. Consider a mass-spring system sitting in front of a cuckoo clock. After π seconds the time is exactly 1 pm. The cuckoo comes out of the clock and strikes the system exerting an impulse on the mass. The system is governed by the symbolic initial value problem

$$x'' + 4x = 2\delta(t - \pi), \qquad x(0) = 0, x'(0) = -2, \qquad (1)$$

where x(t) measures the displacement from the equilibrium.

(a) 4 Determine x(t), i.e. solve the symbolic initial value problem (1).

(b) 1 Carefully sketch a graph of x(t) for $t \in [0, 2\pi]$.

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|----------|---|------|------|------|---|
| -1- | | | | | |
| .1- | | | | | |
| | | | | | |
| 1 | π | /2 1 | τ 3π | /2 2 | π |
| -1- 2 | π | (2 1 | τ 3π | /2 2 | π |