

**Quiz 7, April 6, 2017, 1:15 class**

Use the method of Laplace Transforms to solve

$$x'' + 4x = 0, \quad x(0) = 5, \quad x'(0) = 0.$$

Answer: Let  $X = \mathcal{L}(x)$ . It follows that  $\mathcal{L}(x') = s\mathcal{L}(x) - x(0) = sX - 5$  and  $\mathcal{L}(x'') = s\mathcal{L}(x') - x'(0) = s(sX - 5) - 0 = s^2X - 5s$ .

Transform the original initial value problem to

$$s^2X - 5s + 4X = 0.$$

Solve to get

$$X = \frac{5s}{s^2 + 4}.$$

Thus  $x = \mathcal{L}^{-1}(X) = 5 \cos 2t$ . The solution of the IVP is

$$\boxed{x(t) = 5 \cos 2t.}$$