AOE 3034

Vibrations & Control

HW Set 1, Problem 3

6 September 1999

Find the Laplace transform of the function

 $f(t) = 3\sin(5t + 45^{\circ}), \quad t \ge 0$

• We first use trigonometric identities to expand

$$\sin(5t + 45^{\circ}) = \sin(5t)\cos(45^{\circ}) + \cos(5t)\sin(45^{\circ})$$

• Linearity of the LaPlace transform leads to

$$\mathcal{L}[f(t)] = \cos(45^{\circ}) \mathcal{L}[\sin(5t)] + \sin(45^{\circ}) \mathcal{L}[\cos(5t)]$$

• The transforms of these elementary functions are known

$$\mathcal{L}[f(t)] = \cos(45^{\circ})\frac{5}{s^2 + 25} + \sin(45^{\circ})\frac{s}{s^2 + 25}$$

 $\bullet\,$ which leads to

$$\mathcal{L}[f(t)] = (\sqrt{2}/2)\frac{s+5}{s^2+25}$$