

PRINT Your Name: _____

Quiz for April 8, 2010

The quiz is worth 5 points. **Remove EVERYTHING from your desk except this quiz and a pen or pencil. SHOW every step.** Express your work in a neat and coherent manner. BOX your answer.

Compute the inverse Laplace transform of $F(s) = \frac{3s+5}{s^2-6s+25}$.

You might find of the following formulas to be useful:

$$\begin{aligned}\mathcal{L}(\sin kt) &= \frac{k}{s^2+k^2} \\ \mathcal{L}(\cos kt) &= \frac{s}{s^2+k^2} \\ \text{If } \mathcal{L}(f(t)) &= F(s), \text{ then } \mathcal{L}(e^{at}f(t)) = F(s-a).\end{aligned}$$

ANSWER: We have

$$\begin{aligned}\mathcal{L}^{-1}\left(\frac{3s+5}{s^2-6s+25}\right) &= \mathcal{L}^{-1}\left(\frac{3s+5}{s^2-6s+9+16}\right) = \mathcal{L}^{-1}\left(\frac{3s+5}{(s-3)^2+16}\right) \\ &= \mathcal{L}^{-1}\left(\frac{3(s-3)+5+9}{(s-3)^2+16}\right) = 3\mathcal{L}^{-1}\left(\frac{(s-3)}{(s-3)^2+16}\right) + \frac{7}{2}\mathcal{L}^{-1}\left(\frac{4}{(s-3)^2+16}\right) \\ &= \boxed{3e^{3t} \cos 4t + \frac{7}{2}e^{3t} \sin 4t}.\end{aligned}$$