

NAME: .....

Georgia Tech, Fall 2015  
Math 2552 (Sections F1 – F4)

**Quiz 7**

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**Laplace transforms of some basic functions:**

$$\mathcal{L}\{1\} = \frac{1}{s}; \quad s > 0.$$

$$\mathcal{L}\{\sin(kt)\} = \frac{k}{s^2 + k^2}; \quad s > 0.$$

$$\mathcal{L}\{\sinh(kt)\} = \frac{k}{s^2 - k^2}; \quad s > |k|.$$

$$\mathcal{L}\{t^n\} = \frac{n!}{s^{n+1}}; \quad s > 0.$$

$$\mathcal{L}\{\cos(kt)\} = \frac{s}{s^2 + k^2}; \quad s > 0.$$

$$\mathcal{L}\{\cosh(kt)\} = \frac{s}{s^2 - k^2}; \quad s > |k|.$$

$$\mathcal{L}\{e^{kt}\} = \frac{1}{s - k}; \quad s > k.$$

**Properties of the Laplace transform:**

Translation Theorem:  $\mathcal{L}\{e^{kt}f(t)\} = F(s - k) = \mathcal{L}\{f(t)\}|_{s \rightarrow s-k}$

Derivatives of Laplace Transforms:  $\mathcal{L}\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n} F(s)$

Laplace Transforms of Derivatives:  $\mathcal{L}\{f^{(n)}(t)\} = s^n F(s) - s^{n-1}f(0) - s^{n-2}f'(0) - \dots - sf^{(n-2)}(0) - f^{(n-1)}(0)$

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Find the Laplace transforms below, with the frequency domain as well.

1.  $\mathcal{L}\{te^{4t}\}$ .

2.  $\mathcal{L}\{e^{-3t} \cos(7t)\}$ .

3.  $\mathcal{L}\left\{\frac{e^{\sqrt{2}t} - e^{-\sqrt{2}t}}{2}\right\}$ .

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Find the Laplace transforms below, with the frequency domain as well.

1.  $\mathcal{L}\{te^{-8t}\}$ .

2.  $\mathcal{L}\{e^{2t} \sin(3t)\}$ .

3.  $\mathcal{L}\left\{\frac{e^{10t} + e^{-10t}}{2}\right\}$ .