

Math 251  
Section: 1

Quiz 4  
Summer 2009

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All work must be shown to receive full credit!

1. Compute the following (indicate the identity you are using).

$$\begin{aligned} & (a) \mathcal{L}\{u_\pi(t)(t-\pi)e^{(t-\pi)}\sin(t)\}(s) = \mathcal{L}\{u_\pi(t)(t-\pi)e^{(t-\pi)}\sin((t-\pi)+\pi)\}(s) = \\ & \underline{\underline{(13)}} e^{-\pi s} \mathcal{L}\{t e^t \sin(t+\pi)\}(s) = + e^{-\pi s} \mathcal{L}\{(-t)e^t \sin(t)\}(s) = \\ & \underline{\underline{(19)}} e^{-\pi s} \frac{d}{ds} \mathcal{L}\{e^t \sin t\}(s) \underline{\underline{(9)}} e^{-\pi s} \frac{d}{ds} \frac{1}{(s-1)^2+1^2} \end{aligned}$$

$$\boxed{\sin(t+\pi) = -\sin(t)}$$

$$(b) \mathcal{L}^{-1}\left\{\frac{e^{-2s}}{s^3-s}\right\}(t) \stackrel{(13)}{=} u_2(t) \mathcal{L}^{-1}\left\{\frac{1}{s(s^2-1)}\right\}(t-2) =$$

$$= u_2(t) \mathcal{L}^{-1}\left\{\frac{-1}{s} + \frac{s}{s^2-1}\right\}(t-2) \stackrel{(1)}{\stackrel{(8)}}{=}$$

$$= u_2(t) \left[-1 + \cosh(t-2)\right].$$

$$\frac{1}{s(s^2-1)} = \frac{a}{s} + \frac{bs+c}{s^2-1} = \frac{-1}{s} + \frac{s}{s^2-1}$$

$$s^2: a+b=0 \Rightarrow b=-a$$

$$s: \boxed{c=0}$$

$$1: -a=1 \Rightarrow \boxed{a=-1}$$

$$\Rightarrow \boxed{b=1}$$