2E2 Tutorial Sheet 1[1]

10 October 2003

1. (2) Using the linearity of the Laplace transform, calculate the Laplace transform of

$$f(t) = \sinh(at)$$

2. (2) Using the shift theorem find the Laplace transform of

$$f(t) = e^{2t}t^2$$

The next two questions are about the Laplace transform of f', recall the formula

$$\mathcal{L}(f') = s\mathcal{L}(f) - f(0)$$

3. (2) Find the Laplace transform of both side of the identity

$$\frac{d}{dt}\cosh 3t = 3\sinh 3t$$

and verify that you get the same answer on each side. The idea is that you do the right hand side using the table entry for $\sinh(3t)$ and the left hand side using the formula for f' with $f = \cosh(3t)$. $\cosh(0) = 1$ by the way.

4. (2) Find the Laplace transform of both sides of the differential equation

$$2\frac{df}{dt} = 1$$

with initial conditions $f(0) = 4$. By solving the resulting equations find $F(s)$. Based on the Laplace trasforms you know, decide what $f(t)$ is.

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