Honours Degree of Bachelor of Science in Artificial Intelligence

Batch 22 - Level 2 (Semester 2)

CM 2320 - Mathematical Methods

Tutorial 4

1. Using the definition find the Laplace transform of the following functions. Assume that a, and k are real constants.

(a) $f(t) = k$

(b) $f(t) = 3t + 12$

(c) $f(t) = \cos(at)$

(d) $f(t) = t$

(e) $f(t) = t^n$, (where $n = 0, 1, 2, 3, \dots$)

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2. Using standard rules find the Laplace transform of following functions.

(a) $f(t) = 2t^4 e^{3t}$

(b) $f(t) = 4e^{3t}\cos(5t)$

(c) $f(t) = 4t^3 e^{-2t}$

(d) $f(t) = 4e^{-5t}\sin(t)$

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

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3. Find the Laplace transform of $f(t)$ defined as

$$f(t) = \begin{cases} 1, & 0 < t \leq 1, \\ t, & 1 < t \leq 2, \\ 0, & t > 2. \end{cases}$$

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4. The Laplace transform of a function, $f(t)$, is given by

$$F(s) = \frac{2s+1}{s(s+1)}.$$

State the Laplace transform of following functions.

a) $e^{-2t}f(t)$

b) $e^{3t}f(t)$

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5. The Laplace transform of a function is $\frac{e^{-3s}}{s^2}$. Find the function.

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6. Find the final value of the following functions using the final value theorem.

a) $f(t) = e^{-t}\sin(t)$

b) $f(t) = e^{-t} + 1$

c) $f(t) = e^{-3t}\cos(t) + 5$

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