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Exam ONE, MTH 205, Summer 2009

Ayman Badawi

QUESTION 1. (Each = 6 points, total 36 points)

(i) Find $\ell\{U(x-3)e^{2x}\}$

(ii) Find $\ell\{\int_0^x e^{-3r} sin(2r)\ dr\}$

(iii) Find $\ell^{-1}\{\frac{s+10}{(s+4)^4}\}$

(iv) Find $\ell^{-1}\{\frac{e^{-s}}{(s-1)^2+1}\}$

(v) Use CONVOLUTION to find $\ell^{-1}\{\frac{2s}{(s^2+4)^2}\}$ (Hint: you may need $sin(a)cos(b) = \frac{1}{2}[sin(a+b) + sin(a-b)]$)

(vi) Find $\ell^{-1}\{\frac{8e^{-3s}}{s^2-4}\}$

QUESTION 2. (18 points) Let

$$k(x) = \begin{cases} 0 & 0 \leq x < 4 \\ 6 & x \geq 4 \end{cases}$$

Solve: $y^{(2)} - 3y' + 2y = k(x)$, $y(0) = 0$ and $y'(0) = 0$.

QUESTION 3. (20 points) Solve : $y'(x) = xe^x + \int_0^x 2e^{x-r} y(r)\, dr$, $y(0) = 0$

QUESTION 4. (18 points) solve for $x(t)$ and $y(t)$ (use any method) such that
$x'(t) - y(t) = 2t$
$x(t) - \int_0^t y(r)\, dr = t^2$, $x(0) = 0$.

QUESTION 5. (8 points) Find the largest interval around x = 2 such that $(\sqrt{6-x})y^{(2)} + \frac{3}{x-1}y' + y = \frac{5}{x-7}, y(2) = 0, y'(2) = -1$ has a unique solution.

Faculty information

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