Math 514-151 Homework 2

(Time: 10 days)

Name:.....ID#:.....

Q.1: Verify that (Laplace case) $t^2 * \sin at = \dfrac{t^2}{4} - \dfrac{4}{a^3}\sin^2(at)$ and then verify the convolution theorem.

Q.2: Solve the initial value problem $y'' + 2y' + 9y = 5\cos 2t$, with $y(0) = a$ and $y'(0) = b$.

Q.3: Find $f(t)$ from the integral equation $f(t) = 8t^2 - 3\int\limits_0^t f(\tau)\sin(t-\tau)\,d\tau$

Q.4: Use Laplace transform to solve $u_{xx} = u_{tt} - te^{-x}$, $0 < x < \infty$, $t > 0$ under the following

conditions $\quad u(0,t) = 1 - e^{-t}$, and $\lim\limits_{x\to\infty} |u(x,t)| \sim x^n$ for some n and $t > 0$

$u(x,0) = 0$ and $u_t(x,0) = x$, for $0 < x < \infty$

Q.5: Find $\mathfrak{L}^{-1}\left\{\dfrac{s}{(s^2+9)^2}\right\}$ using Residue theorem.