Student Name:

Sheet 1

Verify the following formulas

$$\int_0^{\infty} \frac{t^{ac-1}}{(1+t^c)^{a+b}}\,dt = \frac{1}{c}\beta(a,b) \qquad \int_0^{1} t^{aq-1}(1-t^q)^{b-1}dt = \frac{1}{q}\beta(a,b)$$

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Sheet 2

Evaluate the following integrals

$$\int_0^{1/2} t^{m-1} \ln(1/2t)\, dt \qquad \int_0^{\infty} a^{-m x^n}\, dx \qquad \int_0^{\infty} x^m e^{-a x^n}\, dx$$

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Sheet 3

Evaluate the following integrals

$$\int_{-\pi/4}^{\pi/4} (\sin\theta + \cos\theta)^{1/3}\, d\theta \qquad \int_{0}^{\infty} \frac{t^2}{1+t^4}\, dt \qquad \int_{0}^{3} \frac{dt}{\sqrt{3t - t^2}}$$

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Sheet 4

Find F(s) of the following functions

$f(t) = e^{-2.7t}[\cos(9.2t + 3)] + \frac{ke^{-k^2/4t}}{\sqrt{4\pi t^3}} + \frac{e^{-k^2/4t}}{\sqrt{\pi t}}$

$g(t) = U(t-3)[-e^{5t} + 2 + 3t^2] + 5\sin(5t+8)\, U(t-\pi)$

$h(t) = t \sin 3t \cosh 2t + 4\sin^2 3t$

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Sheet 5

Find inverse Laplace of the following functions

$$F(s) = \frac{2 - 3se^{-s} + 4e^{-3s}}{s(s+1)} + \frac{s+3}{(s^2+5s+3)}$$

$$G(s) = \frac{5s^2+8s-5}{s^2(s^2+2s+5)} + \frac{9s+4}{(s+3)^3}$$

$$Q(s) = \frac{25}{s^3(s^2+4s+5)} + \frac{9s+4}{(s-3)^2+6}$$

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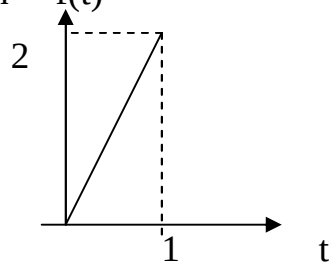
Sheet 6

Solve the following differential equations using Laplace

$y`` + 2y` - 3y = U(t-2)(t-1)$, $y(0) = 1$, $y`(0) = -1$

$y``+ y = f(t)$, $y(\pi/4) = \pi/2$, $y`(\pi/4) = 2-\sqrt{2}$, where f(t) is given by indicated graph



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Sheet 7

Find the harmonic conjugate for the following

$u(x,y) = x^2 - y^2 + y$ $v(x,y) = 2xy + 3y$

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Sheet 8

If $f(z) = e^{x}\cos(ay) + i\, e^{x}\sin(y-b)$ is differentiable at every point, then find a and b.

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Sheet 9

Evaluate the following integrals

$\int_c \frac{\cos(z)}{z^2 - 6z + 5}\, dz$, c is the circle |z| = 4

$\int_c \frac{z^3 + 5z + 7}{(z-i)^2}\, dz$, c: | z-2| + | z+2| = 6

$\int_c \frac{dz}{(z-4)^3}$, c: x = 3cost , y = 2sint

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Sheet 10

Find residues of f(z) = $\frac{z^3+5z+7}{(z-1)^2(z^2-3z-4)}$ using Residue theorem – Laurent series.

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Sheet 11

Find Parabolic equation that fit (3,5), (15,114), (19,201), (23,330)

Find the constants of the curve $y = a\cos x + b \ln x + c e^x$ that fit (1,3), (5,14), (19,101)

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Sheet 12

Solve the following D.E. using series solution about $x = x_0$

$y`` - xy = x+4$ $y`` + xy` = x^2+2$

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Sheet 13

Solve the following D.E. using series solution about x = 0

$2x^2 y`` - x y` + (1+ x^2) y = 0$

$9x^2 y`` - (4+x) y = 0$

Date:

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