

## WRITE COMMANDS TO SOLVE FOLLOWING USING MATLAB

### I. Evaluate the following (Reduction equations)

- $\int_0^{\pi/2} \sin^{45}x \, dx$

```
clear
syms x
f = sin(x)^45
```

$$f = \sin(x)^{45}$$

```
int(f,0,pi/2)
```

ans =

$$\frac{219902325552}{11835556670925}$$

- $\int_0^{\pi/2} \sin^{90}x \, dx$

- $\int_0^{\pi/2} \sin^{80}x \cos^{100}x \, dx$

- $\int_0^{\pi/2} \sin^{65}x \cos^{60}x \, dx$

- $\int_0^{\pi/2} \sin^{100}x \cos^{75}x \, dx$

- $\int_0^{\pi/2} \sin^{75} x \cos^{101} x \, dx$

- $\int_0^a x \sqrt{ax - x^2} \, dx$

- $\int_0^{\pi} x \sin^7 x \, dx$

- $\int_0^{\pi/2} \cos^{60} x \, dx$

- $\int_0^{2\pi} \sin^2 x \cos^4 x \, dx$

- $\int_0^{\pi/4} \sec^{60} x \, dx$

- $\int_0^{\pi} \sin^{20} x \cos^{40} x \, dx$

- $\int_0^{\pi/4} \tan^{50} x \, dx$

## II. Gamma Function:

- $\Gamma\left(\frac{1}{2}\right)$

gamma(1/2)

ans = 1.7725

- $\Gamma\left(\frac{9}{4}\right)$

gamma(9/4)

ans = 1.1330

- $\Gamma\left(\frac{-1}{2}\right)$

gamma(-1/2)

ans = -3.5449

- $\Gamma\left(\frac{3}{4}\right)$

gamma(3/4)

ans = 1.2254

- $\Gamma\left(\frac{-5}{2}\right)$

gamma(-5/2)

ans = -0.9453

- $\int_0^{\infty} x^4 e^{-x} dx$

```
syms x
int(x^4*exp(-x),0,inf)
```

ans =  $\infty$

- $\int_0^{\infty} x^2 e^{-2x^2} dx$

```
syms x
f = x^2*exp(-2*x^2)
```

f =  $x^2 e^{-2x^2}$

```
int(f,0,inf)
```

ans =

$$\frac{\sqrt{2} \sqrt{\pi}}{16}$$

```
eval(ans)
```

ans = 0.1567

- $\int_0^1 e^{-\sqrt{x}} x^3 dx$

```
f = exp(-sqrt(x))*x^3
```

f =  $x^3 e^{-\sqrt{x}}$

```
int(f,0,1)
```

ans =  $10080 - 27400 e^{-1}$

```
eval(ans)
```

ans = 0.1033

### III. Beta Function :

- $\beta(5, 4)$

```
beta(5,4)
```

```
ans = 0.0036
```

- $\beta\left(\frac{1}{2}, \frac{3}{2}\right)$

```
beta(1/2,3/2)
```

```
ans = 1.5708
```

- $\beta\left(1, \frac{1}{2}\right)$

```
beta(1,1/2)
```

```
ans = 2.0000
```

**Represent following beta functions in the form of gamma functions**

- $\beta(x, y)$

```
clear  
syms x y  
expand(beta(x,y))
```

```
ans =
```

$$\frac{\Gamma(x) \Gamma(y)}{\Gamma(x+y)}$$

- $\beta(x^2, y^3)$

```
expand(beta(x^2,y^3))
```

```
ans =
```

$$\frac{\Gamma(x^2) \Gamma(y^3)}{\Gamma(x^2 + y^3)}$$

**IV. Error Function: (Correct to three decimal places accuracy )**

Note: vpa function is used to display answer till 3 decimal places

- erf(0.3)

```
vpa(erf(0.3),3)
```

ans = 0.329

- erf(0.5)

```
vpa(erf(0.5),3)
```

ans = 0.52

- erf(0.8)

```
vpa(erf(0.8),3)
```

ans = 0.742

## V. Differentiation Under Integral Sign (Using Symbolic and Numeric math toolbox)

- $\int_0^1 \frac{x^a - 1}{\log x} dx$
- $\int_0^\infty \frac{dx}{x^2 + a^2}$
- $\int_0^1 x^m dx$
- $\int_0^\pi \log(1 + a \cos x) dx$
- $\int_0^\infty e^{-x} \frac{\sin ax}{x} dx$