17 June 2016

1 o

i)

```
z = 1 - I
Arg[z]
```

$$1 - i$$

$$-\frac{\pi}{4}$$

ii)

```
Clear[x]
Integrate[1 / (x (x^2 + 5)), x]
```

$$\frac{\text{Log}[x]}{5} - \frac{1}{10}\,\text{Log}\left[5 + x^2\right]$$

2 o

ii)

```
A = {{-2, 2, 0}, {1, 2, 1}, {0, 2, -2}};
MatrixForm[A]
Print["|A| = ", Det[A]]
Print["Transpose matrix A    = ",
 Transpose[A] // MatrixForm]
Print["Transpose matrix A .A = ",
 Transpose[A].A // MatrixForm]
```

$$\begin{pmatrix} -2 & 2 & 0 \\ 1 & 2 & 1 \\ 0 & 2 & -2 \end{pmatrix}$$

$|A| = 16$

$$\text{Transpose matrix A} = \begin{pmatrix} -2 & 1 & 0 \\ 2 & 2 & 2 \\ 0 & 1 & -2 \end{pmatrix}$$

$$\text{Transpose matrix A .A} = \begin{pmatrix} 5 & -2 & 1 \\ -2 & 12 & -2 \\ 1 & -2 & 5 \end{pmatrix}$$

ii)

```
Integrate[x Sin[2 x], x]
Integrate[x Sin[2 x], {x, 0, 2 Pi}]
```

$$-\frac{1}{2} x \operatorname{Cos}[2 x] + \frac{1}{4} \operatorname{Sin}[2 x]$$

$-\pi$

3 o

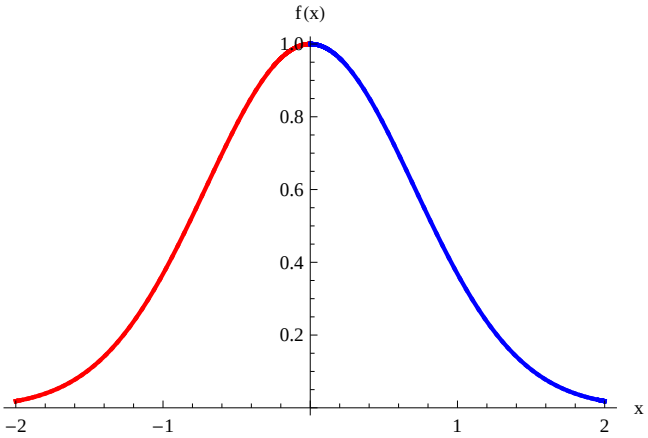
i)

```
ClearAll[f, x];
f[x_] := Exp[-x^2]
Print["Derivative  f'(x)  :  ", Factor[D[f[x], x]]]
Print["Critical Point    :  ",
 Solve[D[f[x], x] == 0, x]]
Print["Derivative  f''(x)  :  ",
 Factor[D[D[f[x], x], x]]]
Print["Derivative  f''(0)  :  ",
 Factor[D[D[f[x], x], x]] /. x → 0, "  maximum at x=0"]
```

```
Derivative  f'(x)  :  -2 ℯ^-x^2 x
Critical Point    :  {{x → 0}}
Derivative  f''(x)  :  2 ℯ^-x^2 (-1 + 2 x^2)
Derivative  f''(0)  :  -2  maximum at x=0
```

The curve of the function f (x) = Exp[-x^2],
when - 2 ≤ x ≤ 2

```
ClearAll[f, x]; f[x_] := Exp[-x^2]
fgr1 = Plot[f[x], {x, -2, 0},
    PlotStyle → Thick, ColorFunction -> Function[Red],
    AxesOrigin → {0, 0}];
fgr2 = Plot[f[x], {x, 0, 2}, PlotStyle → Thick,
    ColorFunction -> Function[Blue]];
fgr = Show[fgr1, fgr2, PlotRange -> All,
  AxesLabel → {"x", "f(x)"}]
```



ii) MACLAURIN’s POLYNOMIAL

```
Print["Maclaurin’s polynomial : ",
 Series[f[x], {x, 0, 2}]]
```

Derivative f’’(x) : $2\,e^{-x^2}\left(-1+2\,x^2\right)$

Maclaurin’s polynomial : $1-x^2+O[x]^3$