

6 July 2015

1 o

i)

$$z = -1 - i$$

Arg[z]

$$-1 - i$$

$$-\frac{3\pi}{4}$$

ii)

Integrate[1 / (4 x^2 + 1), x]

Integrate[1 / (4 x^2 + 1), {x, -Infinity, Infinity}]

$$\frac{1}{2} \text{ArcTan}[2 x]$$

$$\frac{\pi}{2}$$

20

i)

```
A = {{1, -1, 0}, {2, -1, 1}, {-2, 1, 1}};
```

```
MatrixForm[A]
```

```
Det[A];
```

```
Print["|A| = ", Det[A]]
```

```
Print["A+A^T :", A + Transpose[A] // MatrixForm]
```

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

$$|A| = 2$$

$$A+A^T : \begin{pmatrix} 2 & 1 & -2 \\ 1 & -2 & 2 \\ -2 & 2 & 2 \end{pmatrix}$$

ii)

```
Integrate[x Sin[4 x], x]
```

```
Integrate[x Sin[4 x], {x, -Pi, Pi}]
```

$$-\frac{1}{4} x \cos[4 x] + \frac{1}{16} \sin[4 x]$$

$$-\frac{\pi}{2}$$

30

i)

```

ClearAll[f, x];
f[x_] := x Exp[-x^2]
Print["Roots f(x) : ", Solve[f[x] == 0, x]]
Print["Derivative f'(x) : ", Factor[D[f[x], x]]]
Print["Critical Points : ",
      Solve[D[f[x], x] == 0, x]]
Print["Derivative f''(x) : ",
      Factor[D[D[f[x], x], x]]]
f = Plot[f[x], {x, -10, 10},
        PlotRange -> All, AxesOrigin -> {0, 0}]

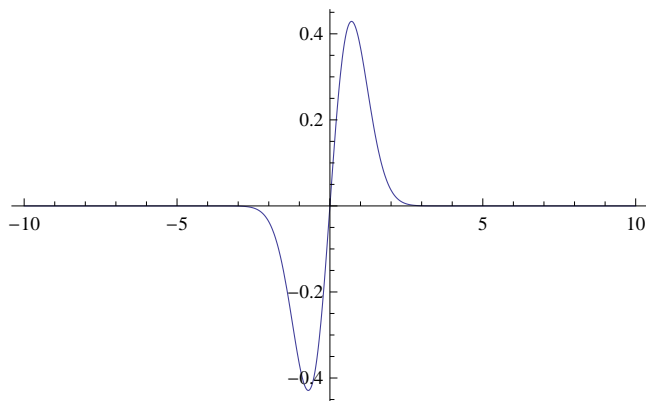
```

Roots $f(x)$: $\{\{x \rightarrow 0\}\}$

Derivative $f'(x)$: $-e^{-x^2} (-1 + 2x^2)$

Critical Points : $\left\{ \left\{ x \rightarrow -\frac{1}{\sqrt{2}} \right\}, \left\{ x \rightarrow \frac{1}{\sqrt{2}} \right\} \right\}$

Derivative $f''(x)$: $2e^{-x^2} x (-3 + 2x^2)$



ii)

```
Clear[f]
```

```
f[x_] := x Exp[-x^2]
```

```
Print["Inflection Points      :  ",
```

```
      Solve[D[D[f[x], x], x] == 0, x], ", Approximately : ",
```

```
      N[Solve[D[D[f[x], x], x] == 0, x], 7]]
```

Inflection Points :

$\left\{ \{x \rightarrow 0\}, \left\{ x \rightarrow -\sqrt{\frac{3}{2}} \right\}, \left\{ x \rightarrow \sqrt{\frac{3}{2}} \right\} \right\}$, Approximately :

$\left\{ \{x \rightarrow 0\}, \{x \rightarrow -1.224745\}, \{x \rightarrow 1.224745\} \right\}$