

18 September 2015

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i)

$$z = -1 + i$$

$\text{Arg}[z]$

$$-1 + i$$

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

ii)

$\text{Integrate}[1 / (x (x^2 + 5)), x]$

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

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i)

```
In[30]:= A = {{-2, 2, 0}, {1, -2, 1}, {0, 2, -2}};
MatrixForm[A]
Print["A^2 = ", A.A // MatrixForm]
Print["Determinant A = ",
  Det[A], " matrix singular"]
```

Out[31]/MatrixForm=

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

$$A^2 = \begin{pmatrix} 6 & -8 & 2 \\ -4 & 8 & -4 \\ 2 & -8 & 6 \end{pmatrix}$$

Determinant A = 0 matrix singular

ii)

```
Integrate[x Exp[-2 x], x]
Integrate[x Exp[-2 x], {x, -1, 1}]
```

$$e^{-2x} \left(-\frac{1}{4} - \frac{x}{2} \right)$$

$$-\frac{3 + e^4}{4 e^2}$$

30

```

In[72]:= ClearAll[f, x];
f[x_] := x^2 Log[x]
Print["Roots f(x) : ", Solve[f[x] == 0, x]]
Print["Derivative f'(x) : ", Factor[D[f[x], x]]]
Print["Critical Point : ",
      Solve[D[f[x], x] == 0, x], " approximately : ",
      N[Solve[D[f[x], x] == 0, x]]]
Print["Derivative f''(x) : ",
      Factor[D[D[f[x], x], x]]]
Print["Inflection Point : ",
      Solve[D[D[f[x], x], x] == 0, x], " approximately : ",
      N[Solve[D[D[f[x], x], x] == 0, x], 7]]

```

Roots $f(x)$: $\{\{x \rightarrow 1\}\}$

Derivative $f'(x)$: $x(1 + 2 \operatorname{Log}[x])$

Critical Point : $\left\{\left\{x \rightarrow \frac{1}{\sqrt{e}}\right\}\right\}$

approximately : $\{\{x \rightarrow 0.6065307\}\}$

Derivative $f''(x)$: $3 + 2 \operatorname{Log}[x]$

Inflection Point : $\left\{\left\{x \rightarrow \frac{1}{e^{3/2}}\right\}\right\}$

approximately : $\{\{x \rightarrow 0.2231302\}\}$

```
In[101]:= ClearAll[f, x]; f[x_] := x^2 Log[x]
fgr1 = Plot[f[x], {x, 0, 0.22}, PlotStyle -> Thick,
  ColorFunction -> Function[Red]];
fgr2 = Plot[f[x], {x, 0.22, 1.2}, PlotStyle -> Thick,
  ColorFunction -> Function[Blue]];
fgr = Show[fgr1, fgr2, PlotRange -> All,
  AxesLabel -> {"x", "f(x)"}]
```

