

TIO 20 September 2013

1 o

i)

$$z1 = 1 - I;$$

$$z2 = 1 + I;$$

$$z1 / z2$$

$$\text{Arg}[z1 / z2]$$

$$-i$$

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

ii)

$$\text{Integrate}[x \text{Sin}[2 x], x]$$

$$\text{Integrate}[x \text{Sin}[2 x], \{x, -\text{Pi}, \text{Pi}\}]$$

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

$$-\pi$$

2 o

i)

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

```
X = {{x1}, {x2}, {x3}};
```

```
MatrixForm[A]
```

```
B = Transpose[A];
```

```
MatrixForm[B]
```

```
MatrixForm[(A + B).X]
```

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

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

$$\begin{pmatrix} -2x_1 + 3x_2 + 4x_3 \\ 3x_1 - 2x_2 + 2x_3 \\ 4x_1 + 2x_2 + 2x_3 \end{pmatrix}$$

ii)

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

```
Integrate[1 / (x^2 + 4), {x, 0, Infinity}]
```

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

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

3 o

i)

```
W[R_] := i^2 R + k^2 / R
```

```
W[R]
```

```
Print["W'[R] = ", D[W[R], R]]
```

```
Solve[D[W[R], R] == 0, R]
```

```
Print["Critical Point : R =  $\frac{k}{i}$ "]
```

```
Print["W''[R] = ", D[D[W[R], R], R] /. R ->  $\frac{k}{i}$ ]
```

$$\frac{k^2}{R} + i^2 R$$

$$W'[R] = i^2 - \frac{k^2}{R^2}$$

$$\left\{ \left\{ R \rightarrow -\frac{k}{i} \right\}, \left\{ R \rightarrow \frac{k}{i} \right\} \right\}$$

$$\text{Critical Point : } R = \frac{k}{i}$$

$$W'[R] = \frac{2i^3}{k}$$

ii)

```
Integrate[(Sin[3 x])^2, x]
```

```
Integrate[(Sin[3 x])^2, {x, 0, Pi}]
```

$$\frac{x}{2} - \frac{1}{12} \text{Sin}[6 x]$$

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