

## 1.2 Tutorial 1: Solving Problems

```
> expr := Int(x^2 * sin(x), x);
```

$$\text{expr} := \int x^2 \sin(x) dx$$

```
> answer := value(expr);
```

$$\text{answer} := -x^2 \cos(x) + 2 \cos(x) + 2 x \sin(x)$$

```
> subs(x=Pi/3, answer);
```

$$-\frac{1}{9} \pi^2 \cos\left(\frac{1}{3} \pi\right) + 2 \cos\left(\frac{1}{3} \pi\right) + \frac{2}{3} \pi \sin\left(\frac{1}{3} \pi\right)$$

```
> simplify(%);
```

$$-\frac{1}{18} \pi^2 + 1 + \frac{1}{3} \pi \sqrt{3}$$

```
> subs(x=Pi/3, answer) -  
subs(x=Pi/4, answer);
```

$$\left| \begin{aligned} & -\frac{1}{9} \pi^2 \cos\left(\frac{1}{3} \pi\right) + 2 \cos\left(\frac{1}{3} \pi\right) + \frac{2}{3} \pi \sin\left(\frac{1}{3} \pi\right) \\ & + \frac{1}{16} \pi^2 \cos\left(\frac{1}{4} \pi\right) - 2 \cos\left(\frac{1}{4} \pi\right) - \frac{1}{2} \pi \sin\left(\frac{1}{4} \pi\right) \end{aligned} \right|$$

`> simplify(%);`

$$\left| -\frac{1}{18} \pi^2 + 1 + \frac{1}{3} \pi \sqrt{3} + \frac{1}{32} \pi^2 \sqrt{2} - \sqrt{2} - \frac{1}{4} \pi \sqrt{2} \right|$$

`> expr := Int(x^2 * sin(x-a), x);`

$$\left| \text{expr} := \int x^2 \sin(x - a) dx \right|$$

`> answer := value(expr);`

$$\left| \begin{aligned} \text{answer} := & -(x - a)^2 \cos(x - a) + 2 \cos(x - a) \\ & + 2(x - a) \sin(x - a) \\ & + 2a(\sin(x - a) - (x - a) \cos(x - a)) \\ & - a^2 \cos(x - a) \end{aligned} \right|$$

```
> plot3d(answer, x=-Pi..Pi,  
a=0..1);
```

