>

MAPLE DEMO #1: PLOTTING, INTEGRATION, APPLICATIONS

PLOTTING

P. 452, #19

> $y := x \rightarrow x^2;$

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> $y(3);$

$$9$$

> $y(2.6);$

$$6.76$$

> $y(\mathrm{Pi});$

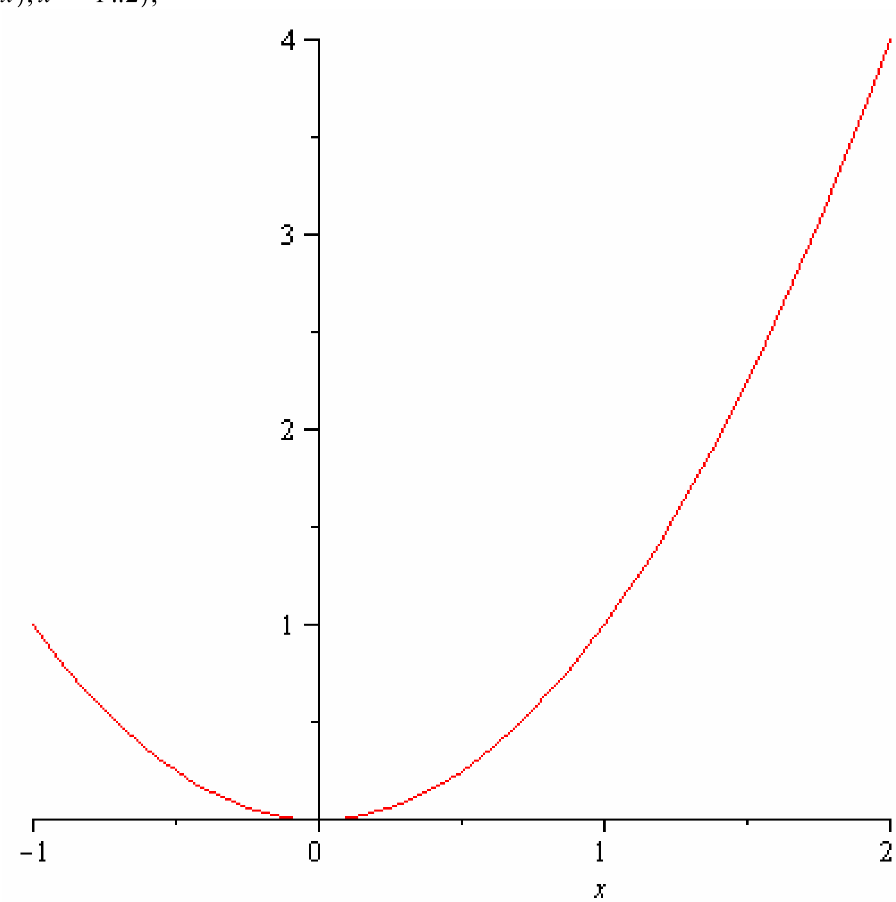
$$\pi^2$$

> $evalf(\%);$

$$9.86960440$$

> $help(plot);$

> $plot(y(x), x = -1\,..2);$



>

Suppose we want to find area under the curve.

> $Int(y(x), x = -1..2);$

$$\int_{-1}^{2} x^2 \, dx$$

>

Int is the inert form of the integration command. It does not evaluate the integral.

> $int(y(x), x = -1..2);$

$$3$$

> $help(int);$

> $int(y(x), x);$

$$\frac{1}{3} x^3$$

> $help(D);$

> $D(y)(x);$

$$2x$$

> $Int\left(\mathrm{sqrt}\left(1 + D(y)(x)^2\right), x = -1..2\right);$

$$\int_{-1}^{2} \sqrt{1 + 4x^2} \, dx$$

> $int\left(\mathrm{sqrt}\left(1 + D(y)(x)^2\right), x = -1..2\right);$

$$\frac{1}{2}\sqrt{5} - \frac{1}{4}\ln\left(-2 + \sqrt{5}\right) + \sqrt{17} - \frac{1}{4}\ln\left(-4 + \sqrt{17}\right)$$

> $evalf(\%);$

$$6.12572661\text{'}$$

>

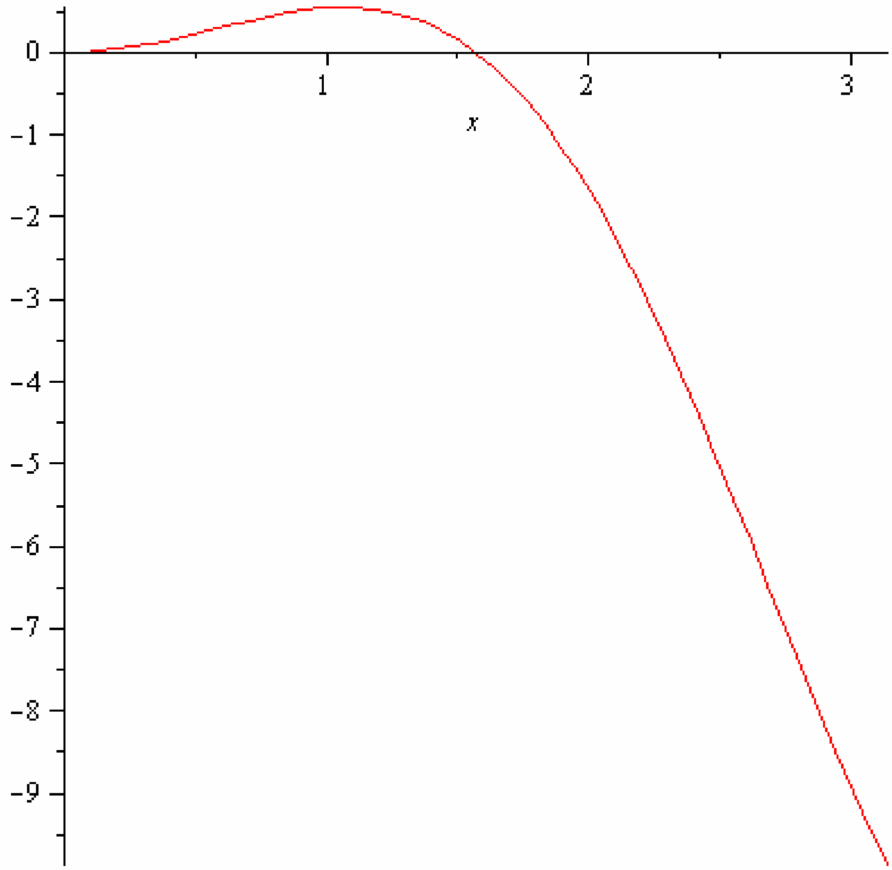
PROBLEM 40, P. 453.

>

> $f := x \rightarrow x^2 \cdot \cos(x);$

$$f := x \rightarrow x^2 \cos(x)$$

> $plot(f(x), x = 0..\mathrm{Pi});$



> D(f)(x);

$$2\,x\cos(x) - x^2\sin(x)$$

> Int(sqrt(1 + D(f)(x)^2), x = 0..Pi);

$$\int_0^{\pi} \sqrt{1 + \left(2\,x\cos(x) - x^2\sin(x)\right)^2}\,dx$$

> int(sqrt(1 + D(f)(x)^2), x = 0..Pi);

$$\int_0^{\pi} \sqrt{1 + \left(2\,x\cos(x) - x^2\sin(x)\right)^2}\,dx$$

>

MAPLE FAILS

> evalf(%);

12.0189012

> evalf(3·%);

36.0567037

>

Find volume of solid obtained by rotating y=x^2 about x-axis.

> $Int\left(\text{Pi}\cdot y(x)^2, x=-1..2\right);$

$$\int_{-1}^{2} \pi x^4 \, dx$$

> $int\left(\text{Pi}\cdot y(x)^2, x=-1..2\right);$

$$\frac{33}{5}\pi$$

> $evalf(\%);$

$$20.7345115$$

>

problem 2, p. 474

> $Int\left(2\cdot\text{Pi}\cdot x^2\cdot\text{sqrt}\left(1+4\cdot x^2\right), x=0..2\right);$

$$\int_{0}^{2} 2\pi x^2\sqrt{1+4x^2}\, dx$$

> $int\left(2\cdot\text{Pi}\cdot x^2\cdot\text{sqrt}\left(1+4\cdot x^2\right), x=0..2\right);$

$$-\frac{1}{16}\sqrt{\pi}\left(\frac{1}{8}\sqrt{\pi}-\frac{1}{4}\left(\frac{1}{2}-6\ln(2)\right)\sqrt{\pi}-66\sqrt{\pi}\sqrt{17}+\frac{1}{2}\sqrt{\pi}\ln\left(\frac{1}{2}+\frac{1}{8}\sqrt{17}\right)\right)$$

> $evalf(\%);$

$$53.2259652$$

> $Int\left(2\cdot\text{Pi}\cdot y\cdot\text{sqrt}\left(\left(\frac{1}{4\cdot y}\right)+1\right), y=0..4\right);$

$$\int_{0}^{4} \pi y\sqrt{\frac{1}{y}+4}\, dy$$

> $int\left(2\cdot\text{Pi}\cdot y\cdot\text{sqrt}\left(\left(\frac{1}{4\cdot y}\right)+1\right), y=0..4\right);$

$$\frac{33}{8}\pi\sqrt{17}-\frac{1}{64}\pi\ln\left(33+8\sqrt{17}\right)$$

> $evalf(\%);$

$$53.2259652$$

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