MAPLE demo on partial fractions and rational functions.

Example #46 p. 564.

```
> 4 · Pi · Int( x / ((x + 1) · (2 − x)), x = 0 ..1 );
```

$$4\,\pi \int_0^1 \frac{x}{(x+1)\,(2-x)}\,dx$$

```
> 4 · Pi · int( x / ((x + 1) · (2 − x)), x = 0 ..1 )
  ;
```

$$\frac{4}{3}\,\pi \ln(2)$$

```
>
    evalf(
    % );
```

$$2$$
$$.903448121$$

```
> f := x → x / ((x + 1) · (2 − x))
  ;
```

$$f := x \to \frac{x}{(x+1)\,(2-x)}$$

```
> help(parfrac);
```

```
> convert(f(x), parfrac, x);
```

$$-\frac{1}{3}\,\frac{1}{x+1} - \frac{2}{3}\,\frac{1}{-2+x}$$

> $int\left(-\frac{1}{3}\,\frac{1}{x+1}-\frac{2}{3}\,\frac{1}{-2+x},x\right);$

$$-\frac{1}{3}\ln(x+1)-\frac{2}{3}\ln(-2+x)$$

>

Example #48 p. 564

> $y:=x\to\frac{(4\cdot x^2+13\cdot x-9)}{(x^3+2\cdot x^2-3\cdot x)};$

$$y:=x\to\frac{4x^2+13x-9}{x^3+2x^2-3x}$$

> $int(y(x),x=3..5);$

$$-2\ln(3)+3\ln(5)$$

> $M := evalf(\%);$

$$M:=2.631089158$$

> $convert(y(x),parfrac,x);$

$$\frac{2}{x-1}-\frac{1}{x+3}+\frac{3}{x}$$

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

$$-\ln(x+3)+2\ln(x-1)+3\ln(x)$$

> $int\left(\frac{y(x)^2}{2},x=3..5\right);$

$$\frac{269}{240}+\frac{11}{2}\ln(3)+\frac{17}{2}\ln(2)-7\ln(5)$$

> $y(x)^2;$

$$\frac{(4x^2+13x-9)^2}{(x^3+2x^2-3x)^2}$$

> $expand(\%);$

$$\frac{16x^4}{(x^3+2x^2-3x)^2}+\frac{104x^3}{(x^3+2x^2-3x)^2}+\frac{97x^2}{(x^3+2x^2-3x)^2}-\frac{234x}{(x^3+2x^2-3x)^2}+\frac{81}{(x^3+2x^2-3x)^2}$$

> $convert(y(x)^2, parfrac, x);$

$$\frac{1}{(x+3)^2}+\frac{9}{x^2}+\frac{11}{x-1}+\frac{3}{x+3}+\frac{4}{(x-1)^2}-\frac{14}{x}$$

> $int\left(\frac{y(x)^2}{2}, x\right);$

$$-\frac{1}{2}\frac{1}{x+3}+\frac{3}{2}\ln(x+3)+\frac{11}{2}\ln(x-1)-\frac{2}{x-1}-\frac{9}{2}\frac{1}{x}-7\ln(x)$$

> $MX := evalf\left(\frac{269}{240}+\frac{11}{2}\ln(3)+\frac{17}{2}\ln(2)-7\ln(5)\right);$

$$MX := 1.78888658$$

> $int(x\cdot y(x), x=3..5);$

$$8\ln(2)+8-3\ln(3)$$

> $convert(x\cdot y(x), parfrac, x);$

$$4+\frac{2}{x-1}+\frac{3}{x+3}$$

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

$$4x + 3\ln(x + 3) + 2\ln(x - 1)$$

> $MY := evalf(8\ln(2) + 8 - 3\ln(3));$

$$MY := 10.24934057$$

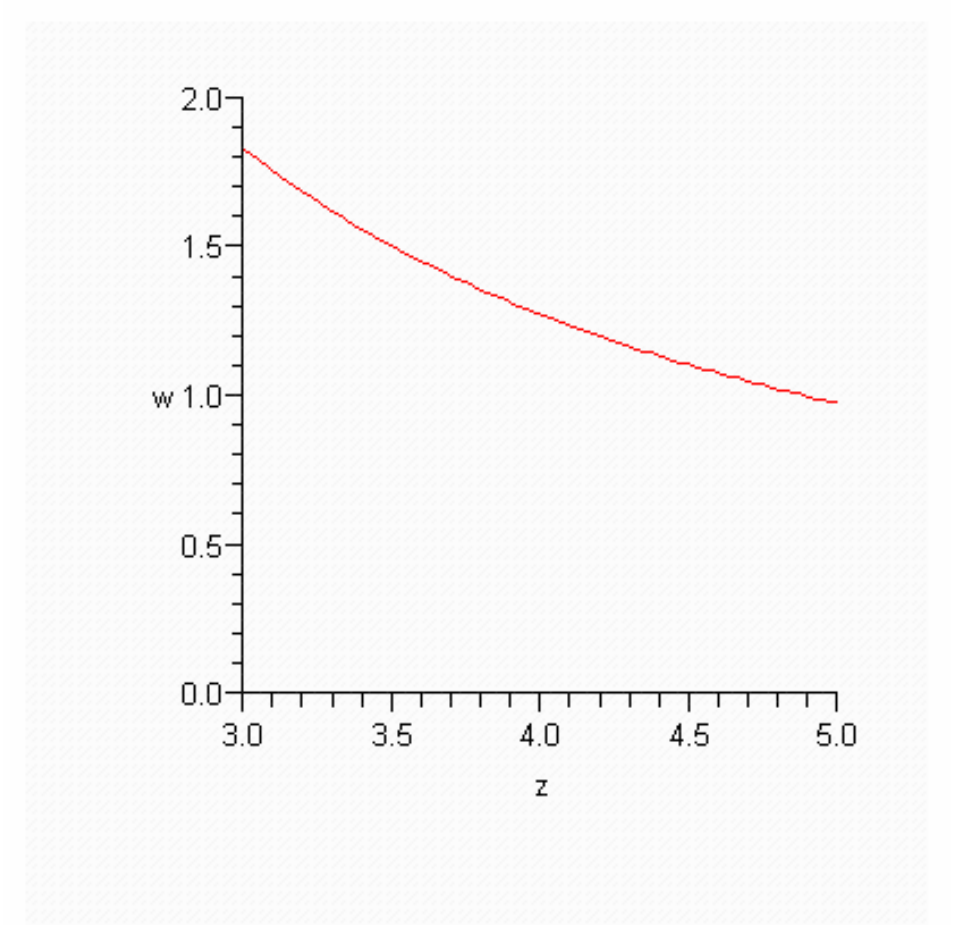
> $x := \frac{MY}{M};$

$$x := 3.895474442$$

> $y := \frac{MX}{M};$

$$y := 0.6799034440$$

> $plot\left(\frac{(4 \cdot z^2 + 13 \cdot z - 9)}{(z^3 + 2 \cdot z^2 - 3 \cdot z)}, z = 3..5, w = 0..2\right);$


2.0
1.5
w 1.0
0.5
0.0
3.0
3.5
4.0
4.5
5.0
z

>