```
> #1.1
> restart
> x := p -> p + exp(-p):
> diff(x(p), p)
```

$$1 - e^{-p} \tag{1}$$

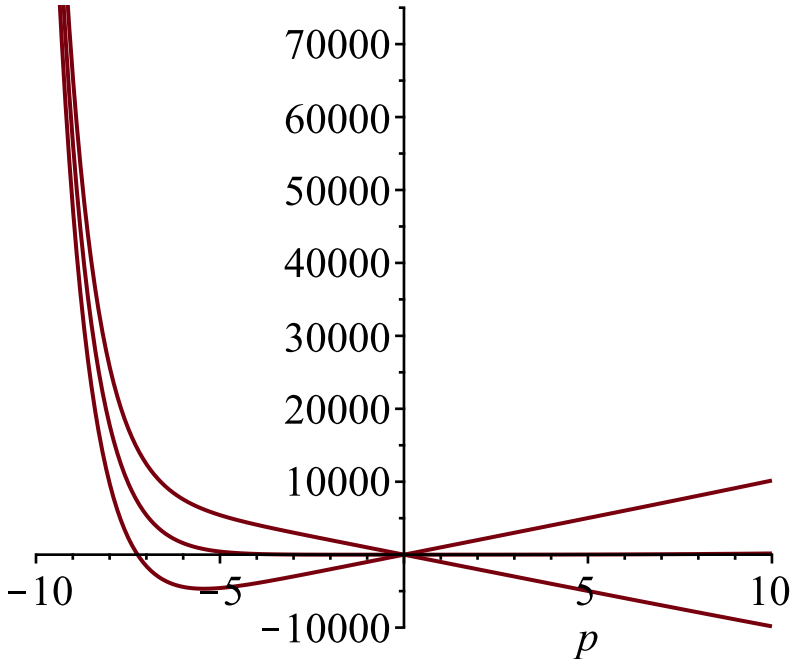
```
> y := rhs(dsolve(d/dp y(p) = p * d/dp x(p)))
```

$$y := p\,e^{-p} + e^{-p} + \frac{p^2}{2} + \_C1 \tag{2}$$

```
> int(y, p)
```

$$\_C1\,p - p\,e^{-p} - 2\,e^{-p} + \frac{p^3}{6} \tag{3}$$

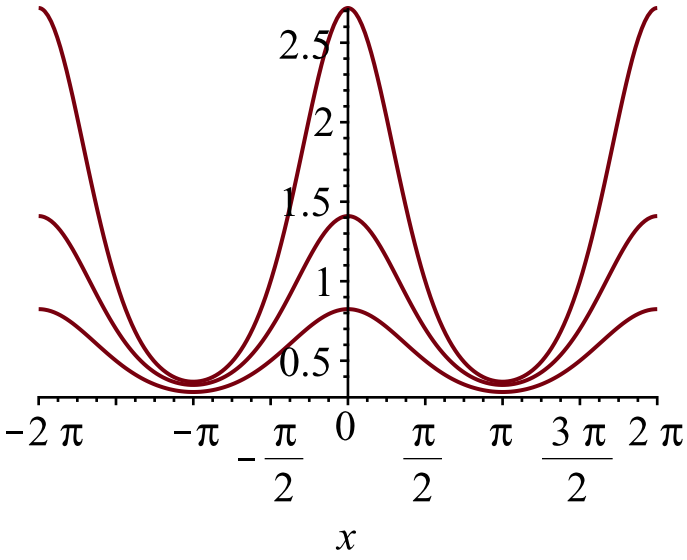
```
> plotc := c -> plot(c * p - p*exp(-p) - 2*exp(-p) + p^3/6):
> plots[display]([plotc(-1000), plotc(0), plotc(1000)])
```




```
> #1.2
> restart
> simplify(dsolve(y(x) * d^2/dx^2 y(x) - (d/dx y(x))^2 - y(x) * d/dx y(x) * cot(x) = 0))
```

$$y(x) = e^{-\_C1\cos(x)}\,\_C2 \tag{4}$$

```
> plotc := c -> plot(e^(c*cos(x)) * c):
> plots[display]([plotc(0.5), plotc(0.7), plotc(1)])
```



> **#1.3**

> *restart*

> $dsolve\left(\frac{d^2}{dx^2}y(x)\cdot\left(1+(y(x))^2\right)+\left(\frac{d}{dx}y(x)\right)^3=0\right)$

$$y(x)=\_C1,\ y(x)=\tan\left(RootOf\left(2\sin(\_Z)\ \_C1+2\sin(\_Z)\ \_Z-\ln\left(\frac{1}{\cos(\_Z)^2}\right)\cos(\_Z)-2\ \_C2\cos(\_Z)-2\,x\cos(\_Z)\right)\right) \quad (5)$$

> **#1.4**

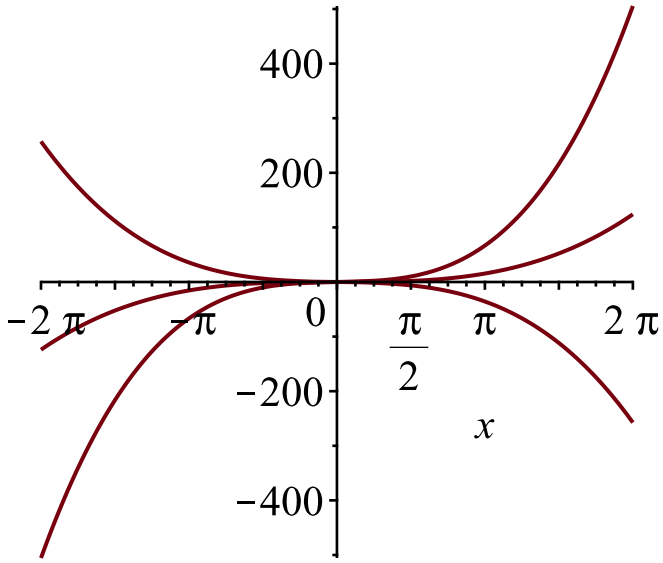
> *restart*

> $dsolve\left(y''(x)=3\left(\frac{y'(x)}{x}-\frac{y(x)}{x^2}\right)+\frac{2}{x^3}\cdot\sin\left(\frac{1}{x^2}\right)\right)$

$$y(x)=x^3\ \_C2+x\ \_C1-\frac{x^3\sin\left(\frac{1}{x^2}\right)}{2} \quad (6)$$

> $plotc:=c\to plot\left(x^3\cdot c+x\cdot c-\frac{x^3\sin\left(\frac{1}{x^2}\right)}{2}\right):$

> $plots[display]([plotc(0.5),plotc(-1),plotc(2)])$



> #2

> $dsolve\left(\frac{d^3}{dx^3}y(x)\cdot x\cdot\ln(x)=\frac{d^2}{dx^2}y(x)\right)$

$$y(x)=\frac{\_C1\ln(x)x^2}{2}-\frac{3\_C1x^2}{4}+\_C2x+\_C3 \quad (7)$$

> #3

> $dsolve\left(\frac{d^2}{dx^2}y(x)+2\frac{d}{dx}y(x)=4\cdot\exp(x)\cdot(\sin(x)+\cos(x))\right)$

$$y(x)=-\frac{2e^x\cos(x)}{5}+\frac{6e^x\sin(x)}{5}-\frac{\_C1}{2(e^x)^2}+\_C2 \quad (8)$$

>