```
>
```

```
Warning, the name changecoords has been redefined

Warning, the protected names norm and trace have been redefined and unprotected
```

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Math 152-512

Lab 5

1)

```
> with(DEtools):
> y:='y';eq:=diff(y(x),x$1)=(x*y(x)+3*x)/(x^2+1);
```

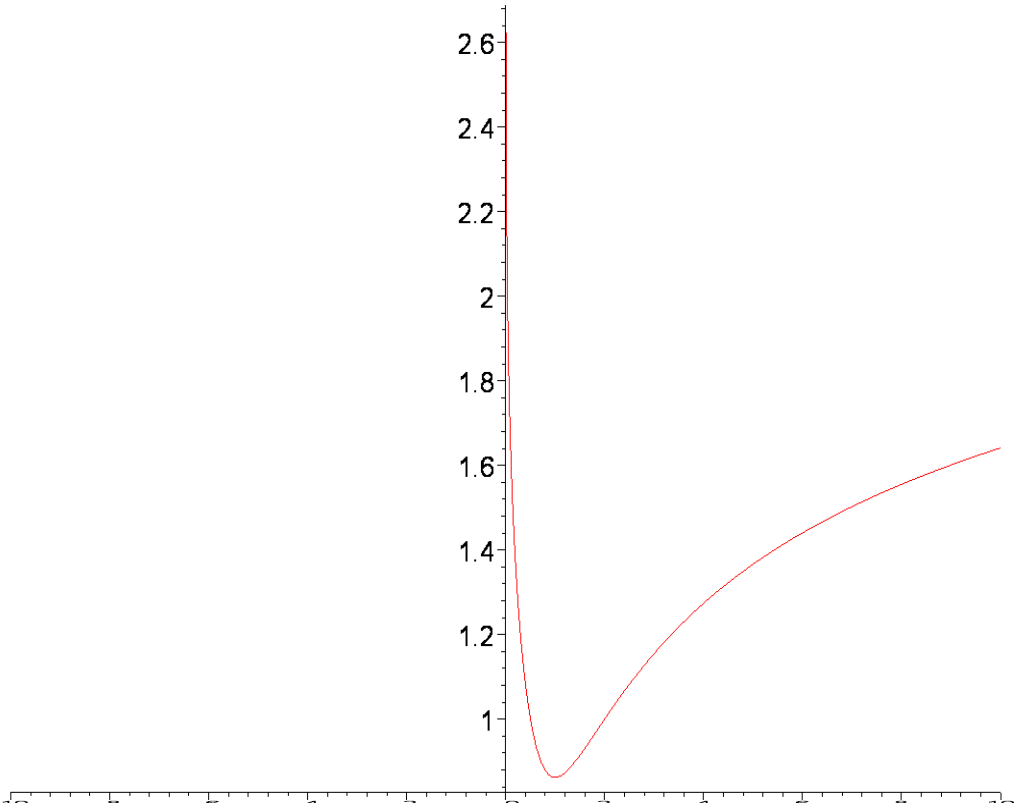
$$y := y$$

$$eq := \frac{\partial}{\partial x}\,\mathrm{y}(x) = \frac{x\,\mathrm{y}(x) + 3\,x}{x^2 + 1}$$

```
> dsolve({eq,y(2)=1},y(x));
>
```

$$soln := \mathrm{y}(x) = \sqrt{-1 + \sqrt{4 + 2\,\ln(x)^2 - 2\,\ln(2)^2}}$$

```
> with(plots):
> plot(rhs(soln),x=-10..10);
>
```



2)

```
> y:='y';eq:=diff(y(x),x$1)=ln(x)/(x*y(x)+x*y(x)^3);
```

$$y := y$$

$$eq := \frac{\partial}{\partial x} y(x) = \frac{\ln(x)}{x\,y(x) + x\,y(x)^3}$$

```
> dsolve(eq,y(x));
```

$$y(x) = \sqrt{-1 + \sqrt{1 + 2\ln(x)^2 + 4\_C1}}\,,\ y(x) = \sqrt{-1 - \sqrt{1 + 2\ln(x)^2 + 4\_C1}}\,,$$

$$y(x) = -\sqrt{-1 + \sqrt{1 + 2\ln(x)^2 + 4\_C1}}\,,\ y(x) = -\sqrt{-1 - \sqrt{1 + 2\ln(x)^2 + 4\_C1}}$$

a)

```
> limit(Int(3*x^(-3/4),x=1..t),t=infinity);evalf(%);
```

$$\lim_{t \to \infty} \int_1^t 3\,\frac{1}{x^{(3/4)}}\,dx$$

$$\infty$$

b)

```
> limit(Int(3/(5+3*exp(x)),x=0..t),t=infinity);value(%);
>
```

$$\lim_{t \to \infty} \int_0^t 3\,\frac{1}{5 + 3\,\mathbf{e}^x}\,dx$$

$$-\frac{3}{5}\ln(3) + \frac{9}{5}\ln(2)$$

```
>
```