Examples of the plottools package .
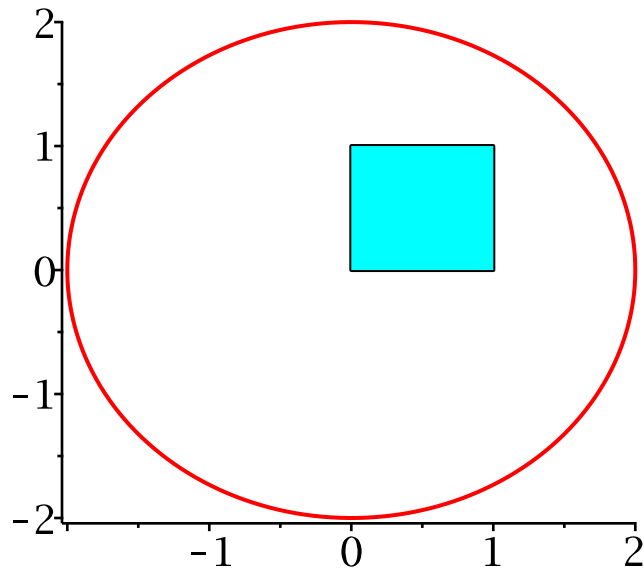
Michael Monagan, October 2018.

```
> with(plots):
> with(plottools):
> display( circle([0,0],2,color=red), polygon([[0,0],[0,1],[1,1],
  [1,0]],color=cyan),  axes=frame );
```



```
> box := proc(x,y,h) polygon([[x,0],[x,y],[x+h,y],[x+h,0]],color=
  cyan) end;
```

$$box := \textbf{proc}(x, y, h) \tag{1}$$
$$\quad plottools{:}{-}polygon([[x, 0], [x, y], [x+h, y], [x+h, 0]], color = cyan)$$
end proc

```
> a,b := 0.0,2.0;
```
$$a, b := 0., 2.0 \tag{2}$$

```
> f := x -> sin(x);
```
$$f := x \mapsto \sin(x) \tag{3}$$

```
> n := 10;
```
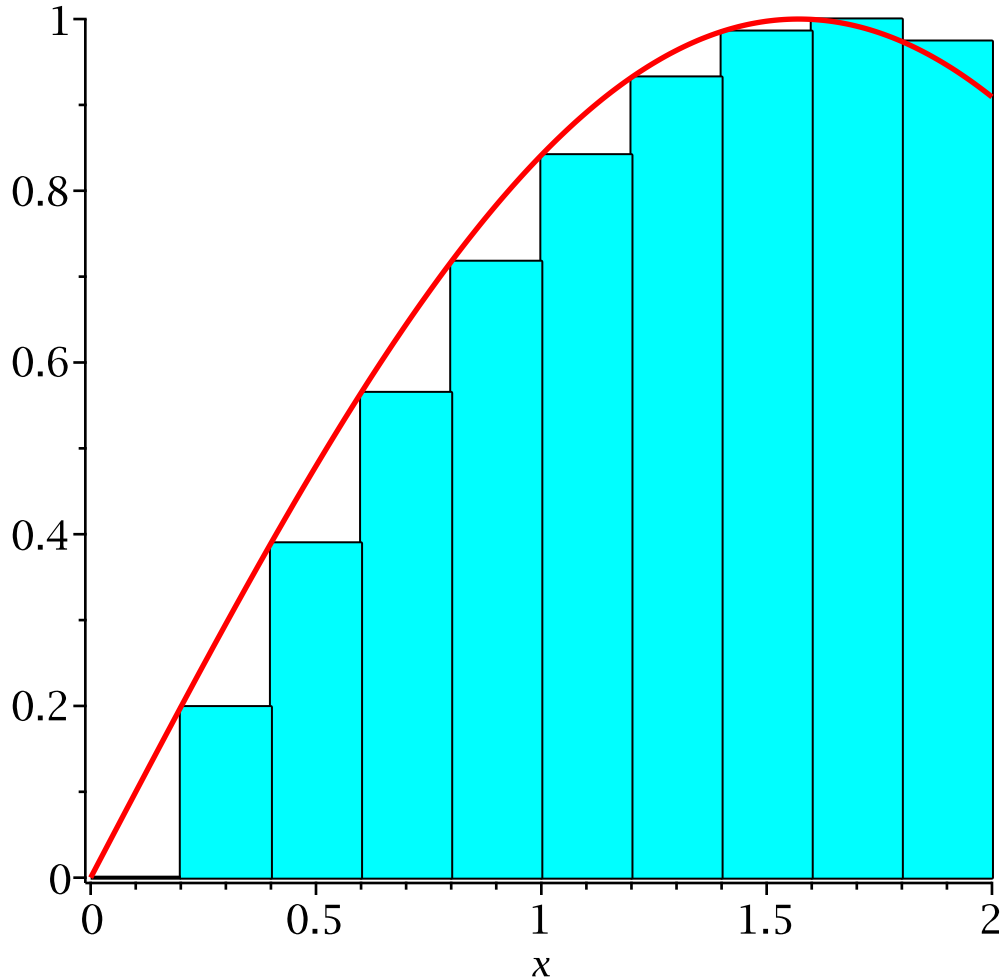$$n := 10 \tag{4}$$

```
> h := (b-a)/n;
```
$$h := 0.2000000000 \tag{5}$$

```
> RiemannSum := [seq( box(a+i*h,f(a+i*h),h), i=0..n-1 )]:
> fplot := plot( f(x), x=a..b, colour=red, thickness=2 ):
> display( fplot, RiemannSum, axes=frame, title="Riemann sum plot
  for sin(x) with n=10"  );
```

Riemann sum plot for sin(x) with n=10


```
> trapezoid := proc(xL,yL,xR,yR) polygon([[xL,0],[xL,yL],[xR,yR],
  [xR,0]],color=cyan) end;
```

$trapezoid := \textbf{proc}(xL, yL, xR, yR)$ **(6)**

$\quad plottools{:}{-}polygon([[xL, 0], [xL, yL], [xR, yR], [xR, 0]], color = cyan)$

end proc

```
> n := 4;
```

$$n := 4 \qquad \textbf{(7)}$$

```
> h := (b-a)/n;
```

$$h := 0.5000000000 \qquad \textbf{(8)}$$

```
> RiemannSum := [seq( trapezoid(a+i*h,f(a+i*h),a+i*h+h,f(a+i*h+h)),
  i=0..n-1 )]:
> display( fplot, RiemannSum, axes=frame, title="Trapezoidal rule
  for sin(x) with n=10"  );
```

Trapezoidal rule for sin(x) with n=10