## Hand solution steps 2.4-3

**h=0.25** $y' = y+1,\ y(0)=1$

$f(x,y) = y+1$ RHS of $y' = f(x,y)$

$x_0 = 0,\ y_0 = 1$ From $y(0)=1$

$y = y_0 + h\, f(x_0,y_0)$ Euler algorithm

$= 1 + 0.25(y_0+1)$

$= 1.5$

Dots[2] = [0.25, 1.5] Line 2 of Dots Table, h=0.25

Ans check: matches Dots Table in maple worksheet appendix.

**h=0.1** $y' = y+1,\ y(0)=1$

$x_0 = 0,\ y_0 = 1,\ h = 0.1$ From $y(0)=1$

$y = y_0 + h\, f(x_0,y_0)$

$= y_0 + h(y_0+1)$

$= 1 + 2h$

$= 1.2$

Dots[1] = [0.1, 1.2] Line 2 of Dots table for h=0.1

## Graphics 2.4-3

See the maple worksheet appendix

# Maple Worksheet Appendix

2.4-3 Edwards and Penney

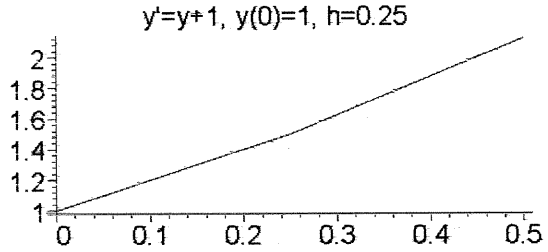
```
> # 2.4-3(h=0.25) Euler. Group 1, initialize.
  f:=unapply(y+1,(x,y)):
  x0:=0: y0:=1: h:=0.25: Dots1:=[x0,y0]:
```

```
> # Group 2, repeat 2 times. Euler's method
   Y:=y0+h*f(x0,y0);
   x0:=x0+h:y0:=Y:Dots1:=Dots1,[x0,y0];
```

$$Y := 2.1250$$

$$Dots1 := [0, 1], [.25, 1.50], [.50, 2.1250]$$

```
> # Group 3, plot.
   plot([Dots1],title="y'=y+1, y(0)=1, h=0.25");
```




```
> # 2.4-3(h=0.1) Euler. Group 1, initialize.
  f:=unapply(y+1,(x,y)):
  x0:=0: y0:=1: h:=0.1: Dots2:=[x0,y0]:
```

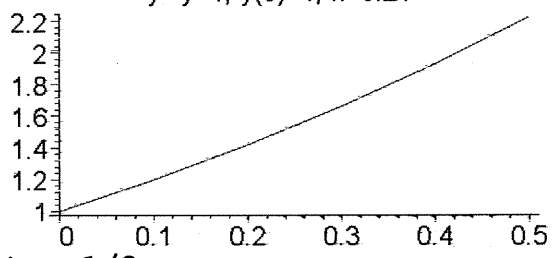
```
> # Group 2, repeat 5 times. Euler's method
   Y:=y0+h*f(x0,y0);
   x0:=x0+h: y0:=Y: Dots2:=Dots2,[x0,y0];
```

$Y := 2.22102$

$$Y := 2.22102$$

$$Dots2 := [0, 1], [.1, 1.2], [.2, 1.42], [.3, 1.662], [.4, 1.9282], [.5, 2.22102]$$

```
> # Group 3, plot.
   plot([Dots2],title="y'=y+1, y(0)=1, h=0.21");
```




```
> # Exact solution at x=1/2
  exacty:=unapply(2*exp(x)-1,x): evalf(exacty(1/2));
```

$$2.297442542$$

```
> plot(exacty(x), x=0..5);   # plot matches one above - not printed here to save
                             # paper and pdf file size = 6B6
```