Math 308 Maple Quiz 1 Summer 2003¶
Sec 301,302 Version B¶

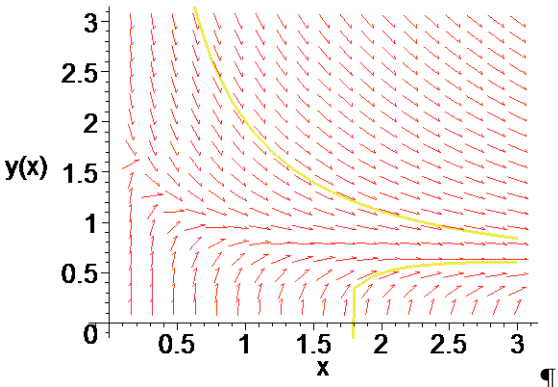
```
> restart;with(DEtools):¶
```

#1¶

```
> deq:=diff(y(x),x)=(2-3*x*y(x)^3)/(3*x^2*y(x)^2);¶
```

$$deq := \frac{d}{dx}\,y(x) = \frac{1}{3}\,\frac{2-3\,x\,y(x)^3}{x^2\,y(x)^2}\text{¶}$$

```
> DEplot(deq,y(x),x=0..3,y=0..3,[[2,.5],[1,2]]);¶
```



¶

#2¶

```
> F:=(x,y)->(2-3*x*y^3)/(3*x^2*y^2);¶
```

$$F := (x,y) \to \frac{1}{3}\,\frac{2-3\,x\,y^3}{x^2\,y^2}\text{¶}$$

```
> h:=.2;¶
```

$$h := 0.2\text{¶}$$

```
> xs[0]:=1;ys[0]:=2;¶
```

$$xs_0 := 1\text{¶}$$

$$ys_0 := 2\text{¶}$$

```
> for i from 1 to 10 do↵
  xs[i]:=xs[i-1]+h;↵
  ys[i]:=ys[i-1]+F(xs[i-1],ys[i-1])*h;↵
  end do;¶
```

$$xs_1 := 1.2\text{¶}$$

$$ys_1 := 1.633333333\text{¶}$$

$$xs_2 := 1.4\text{¶}$$

$$ys_2 := 1.395818871\text{¶}$$

$$xs_3 := 1.6\text{¶}$$

$$ys_3 := 1.231332179\text{¶}$$

$$xs_4 := 1.8\text{¶}$$

$$ys_4 := 1.111767363$$

$$xs_5 := 2.0$$

$$ys_5 := 1.021531649$$

$$xs_6 := 2.2$$

$$ys_6 := 0.9513214393$$

$$xs_7 := 2.4$$

$$ys_7 := 0.8952772626$$

$$xs_8 := 2.6$$

$$ys_8 := 0.8495510870$$

$$xs_9 := 2.8$$

$$ys_9 := 0.8115293301$$

$$xs_{10} := 3.0$$

$$ys_{10} := 0.7793863975$$

#3

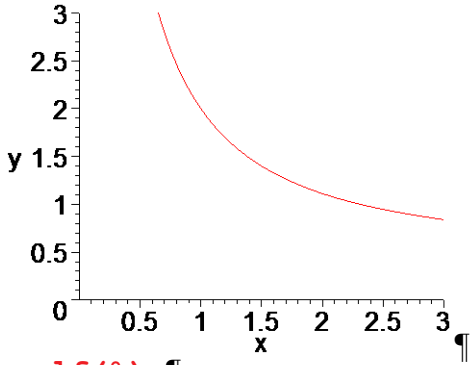
```
> init:=y(1)=2;
```

$$init := y(1) = 2$$

```
> sol:=dsolve({deq,init},y(x));
```

$$sol := y(x) = \frac{(x^2+7)^{(1/3)}}{x}$$

```
> plot(rhs(sol),x=0..3,y=0..3);
```




```
> subs(x=3,rhs(sol)); evalf(%);
```

$$\frac{16^{(1/3)}}{3}$$

$$0.8399473666$$

#4

The Euler approximation .7794 is smaller than the exact value .8399 because the solution is concave up so the tangent lines are always below the curve.