Sensitivity analysis:

$$S(t,c)$$

exponential rate of growth of the pig...

$$w(t) = 200\, e^{ct}$$

Using the Pluto notebook interface...

```
julia> using Pluto

julia> Pluto.run()
[ Info: Loading...
┌ Info:
│ Opening http://localhost:1234/?secret=EDiuOkQN in your default browser...
ve fun!
└
┌ Info:
│ Press Ctrl+C in this terminal to stop Pluto
└
```

```
dPdt = -0.45 - 2.0exp(c*t) + 200c*(0.65 - 0.01t)*exp(c*t)
dPdt=D(P(t),t)
```

$= u(t,c) = 0$

$$S(t,c) = \frac{c}{t}\frac{dt}{dc}\bigg| \approx \frac{c}{t}\frac{\Delta t}{\Delta c} = \frac{c_0}{t_0}\frac{(t_1 - t_0)}{(c_1 - c_0)} = 2.84.$$

Sensitivity of t with respect to changes in c at the best estimate...

$t =$ 19.46815944416122

$c = 1/40$

$c_0 = 1/40$,

$t_0 =$ 19.46815944416122

$c_1 = (1.01)\ 1/40$

$t_1 = 20.021136,$

with implicit differentiation

$$u(t,c) = 0$$

$$\frac{d}{dc} u(t,c) = \frac{d}{dc} 0$$

$$\frac{d}{dc}u(t,c) = \frac{\partial u}{\partial t}\frac{dt}{dc} + \frac{\partial u}{\partial c} = 0$$

$$\frac{dt}{dc} = -\frac{\partial u/\partial c}{\partial u/\partial t}$$

compare with 2.84 from the book's estimate using $\Delta t/\Delta c$ to approx dt/dc.

```
Stc = 2.8746311019686357
Stc=substitute(c/t*dtdc,[c=>1/40,t=>19.46815944415122])
```