1. (euler:nonlinear)
   Suppose that p is a function of t, satisfying

$$\begin{aligned} tp' &= a(p^2 + t^2) \\ p(1) &= 2 \end{aligned}$$

   where a is some small unknown constant. Using Euler's method with step size 2, approximate $p(5)$. Your answer will depend on a.

2. (euler:sin(0.3))
   Use Euler's method with step size 0.1 to approximate sin(0.3)

3. (eulersMethod:Gaussian)
   Solve the following initial value problem exactly, then use Euler's method with step size $\Delta x = .1$ to estimate $y(.3)$.

$$\begin{aligned} \frac{dy}{dx} &= -2xy \\ y(0) &= 1 \end{aligned}$$

4. (eulersMethod:linear1)
   Solve the following initial value problem exactly, then use Euler's method with a step size of $\Delta x = .1$ to approximate $y(1.3)$.

$$\begin{aligned} \frac{dy}{dx} &= 1 + y \\ y(1) &= 0 \end{aligned}$$

5. (eulersMethod:sep1)
   Find an exact solution to the following initial value problem, then use Euler's method with step size $\Delta x = .1$ to estimate $y(.2)$.

$$\frac{dy}{dx} = -xy + 2x$$

6. (eulersMethod:q1)
   Find an exact solution to the following initial value problem, then use Euler's method with step size $\Delta x = .1$ to estimate $y(.2)$

$$\begin{aligned} \frac{dy}{dx} &= 2xy + x \\ y(0) &= 0 \end{aligned}$$

7. (eulersMethod:q2)
Find an explicit solution to the following initial value problem, then use Euler's method with step size $\Delta x = .1$ to estimate $y(.2)$.

$$\frac{dy}{dx} = 2xy + 2x$$
$$y(0) = 0$$