電腦在工程數學應用—作業六

HW1: Nonlinear ODE

$$\frac{dy}{dx} = y^2, y(0) = 1$$

Solve $y(x)$ and plot $y(x)$.

HW2: Stability of ODE

$$\frac{dy}{dx} - 2y = -3e^{-x}, y(0) = y_0$$

Solve $y(x)$ and plot $y(x)$ for $y_0 = 0.97, 1.0, 1.03$.

HW3: Qualitative approach

$$\frac{dx}{dt} = e^{-t} - 2x$$

```
<< Graphics `PlotField`
PlotVectorField[{1, Exp[-t]-2x}, {t,-2,3}, {x,-1,2}, ScaleFunction->(1&),
Axes->True, Ticks->None, Frame->True,AspectRatio->1]
```

HW4: Find $y(x), x = 1.1, 1.2...2.0$ by Euler Method for the ODE

$$\frac{dy}{dx} = x + 2y, y(1) = 0.5$$

HW5: Find Wronskian of $e^x, e^{-x}, cosh(x)$.

HW6: Find Wronskian of $e^x, e^{-x}, cosh(x), sinh(x)$.

HW7: If $x_p(t) = Asin(\bar{\omega}t + \phi)$ is a particular solution for

$$\ddot{x}(t) + 2\xi\omega\dot{x}(t) + \omega^2 x(t) = sin(\bar{\omega}t)$$

Find A, ϕ in terms of $(\xi, \omega, \bar{\omega})$.

HW8: Find Laplace transform of $1, t, t^2$.

HW9: Find Laplace transform of $1/t, 1/t^2$.

HW10: Solve the Riccati ODE of

$$u' = (1 - 2x^2) + xu + u^2$$

One solution is x, find the other one by Mathematica.