

Worksheet #3: ODE review

- (1) Show that the transformation $w = u^{1-n}$ makes the “Bernoulli equation”

$$u'(t) + p(t)u(t) = q(t)u^n(t)$$

(which looks nonlinear) into a linear equation. In other words, equation is of the form $v'(t) + \tilde{p}(t)v(t) = \tilde{q}(t)$. What are the functions $\tilde{p}(t)$ and $\tilde{q}(t)$?

- (2) What method(s) would you use to solve the following ordinary differential equations?

Note you may need more than one.

(a) $u'' + 2t(u')^2 = 0$

(b) $u'' + 3u' + 2u = t$

(c) $u'' + u' = u + \ln t$

(d) $\frac{u'}{u} = t^2u^3 + \frac{1}{t}$