Special Problem B-2

Find the general solution for each of the following differential equations. Do not solve for any arbitrary constants.

(a) $\dfrac{d\psi}{d\eta} + \dfrac{a\eta}{2}\psi = 0, \quad \psi = \psi(\eta)$, a is a constant

(b) $\dfrac{d\psi}{d\eta} + \dfrac{a\eta}{2}\psi = \dfrac{2}{\sqrt{\pi}}, \quad \psi = \psi(\eta)$, a is a constant

(c) $\dfrac{d^2 v_x}{dy^2} = \dfrac{\Delta P}{\mu L}, \quad v_x = v_x(y)$, ΔP, μ, L are constants

(d) $\dfrac{d^2x}{dt^2} + \dfrac{dx}{dt} + \dfrac{5}{4}x = 0$

(e) $\dfrac{d^2x}{dt^2} + \dfrac{dx}{dt} + \dfrac{5}{4}x = 1$

(f) $r^4\dfrac{d^4 f}{dr^4} - 4r^2\dfrac{d^2 f}{dr^2} + 8r\dfrac{df}{dr} - 8f = 0, \quad f = f(r)^*$

**Hint: This is an equidimensional equation. Use a guess of* $f = Cr^n$ *to find the characteristic equation.*