from #3(a), the ordinary differential equation -

$$-c \cdot \frac{dv}{dy} + 6v(y) \cdot \frac{dv}{dy} + \frac{d^3 v}{dy^3} = 0$$

Now, $z = y\sqrt{c}$ and, $v(y) = c\,w(z)$

$\Rightarrow dv = c\,dw$

$\Rightarrow y = \frac{1}{\sqrt{c}} z$

$\Rightarrow dy = \frac{1}{\sqrt{c}} dz.$

So, we obtain,

$$-c \cdot \frac{c\,dw}{\frac{1}{\sqrt{c}}dz} + 6 \cdot c \cdot w(z) \cdot \frac{c \cdot dw}{\frac{1}{\sqrt{c}}dz} + \frac{1}{(1/\sqrt{c})^3} \cdot c \cdot \frac{d^3 w}{dz^3} = 0$$

$$\Rightarrow -c^2\sqrt{c} \cdot \frac{dw}{dz} + 6c^2\sqrt{c} \cdot w(z) \cdot \frac{dw}{dz} + c^2\sqrt{c} \cdot \frac{d^3 w}{dz^3} = 0$$

$$\Rightarrow \boxed{\frac{dw}{dz} + 6\,w(z)\frac{dw}{dz} + \frac{d^3 w}{dz^3} = 0}$$

which is a parameter-free form of equation as there is no "c" (velocity of wave) present in the equation.

So, substituting $z = y\sqrt{c}$ and $v(y) = c\,w(z)$ gives us a parameter-free steady-state KdV equation.

[Showed]