N1

$$H = N\left(\frac{4b^2 v G}{\pi^2}\right)^{1/3}$$

$$\frac{\pi}{2}(1-u) = \int_u^1 \frac{f(t)\,dt}{(t-u)^{1/2}} \qquad f(1)=0$$

$$\frac{\pi}{2}(1-u) = \int_{u-1}^{0} \frac{f(t+1)}{\sqrt{t+1-u}} \Rightarrow \frac{\pi}{2}(u-1) = \int_0^{u-1} \frac{\overbrace{f(t+1)}^{g(t)}\,dt}{\sqrt{t+1-u}} =$$

$$= \int_0^{\tilde{u}} \frac{g(t)\,dt}{\sqrt{t-\tilde{u}}} = \frac{\pi}{2}\tilde{u} = \int_0^{\tilde{u}} \frac{g(t)\,dt}{i\sqrt{\tilde{u}-t}} \Rightarrow$$

$$\Rightarrow \frac{\pi i \tilde{u}}{2} = \int_0^{\tilde{u}} \frac{g(t)\,dt}{\sqrt{\tilde{u}-t}} \Rightarrow \mathcal{L}\left\{\frac{\pi i \tilde{u}}{2}\right\} = \mathcal{L}\left\{\int_0^{\tilde{u}} \frac{g(t)\,dt}{\sqrt{\tilde{u}-t}}\right\}$$

$$\mathcal{L}\{g(\tilde{u})\}\,\mathcal{L}\left\{\frac{1}{\sqrt{\tilde{u}}}\right\} \Rightarrow \mathcal{L}\{g(\tilde{u})\} = \frac{i\sqrt{\pi}}{2}\cdot s^{-3/2}$$

$$g(\tilde{u}) = \mathcal{L}^{-1}\left\{\frac{i\sqrt{\pi}}{2s^{3/2}}\right\} = i\sqrt{\tilde{u}} = \cancel{\sqrt{1-u}} \qquad \cancel{g(u) = \sqrt{1-u}}$$

$$f(\tilde{u}) = \sqrt{1-\tilde{u}} \qquad f(u) = \sqrt{1-u} \Rightarrow g'(\sqrt{u}) = 3\sqrt{u}\sqrt{1-u}$$

$$g'\left(\frac{h}{H}\right) = 3\,\frac{h}{H}\cdot\sqrt{1-\left(\frac{h}{H}\right)^2} \Rightarrow \Psi(h) = \frac{3h}{H^2}\sqrt{1-\left(\frac{h}{H}\right)^2}$$