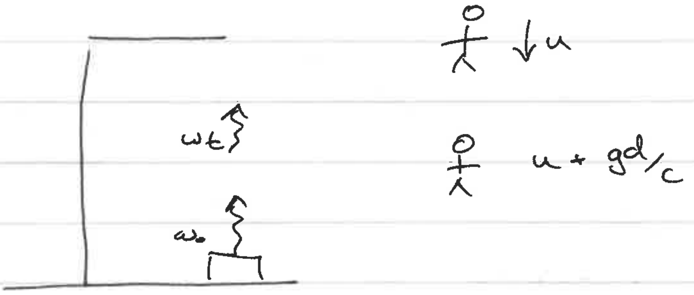
4)




Effectively the same shift as in derivation...

$$\omega_t = \omega_0 \,(1 - gd/c^2)$$

in observers frame: $\omega_0' = \omega_0 \left( \frac{1 + u/c}{1 - u/c} \right)^{1/2}$

$$\cancel{\omega_t' = \omega_0' \left( \frac{1 + gd/c^2}{1 - gd/c^2} \right)^{1/2}}$$

$$\cancel{= \omega_0 \,(1 - gd/c^2)}$$

$$\omega_t' = \omega_t \left( \frac{1 + gd/c^2}{1 - gd/c^2} \right)^{-1/2} = \omega_0 \,(1 - gd/c^2)^{1/2} (1 + gd/c^2)^{1/2}$$

$$= \omega_0 \left( 1 - \left( \frac{gd}{c^2} \right)^2 \right)^{1/2}$$

$$\approx \omega_0 \quad //$$

SEP: All laws of physics take their SR form in freely falling frame. (i.e. no grav. redshift.

5) On the surface of a sphere, the metric is

$$ds^2 = a^2 d\theta^2 + a^2 \sin^2\theta \, d\phi^2 \qquad g_{\mu\nu} = a^2 \begin{pmatrix} 1 & 0 \\ 0 & \sin^2\theta \end{pmatrix}$$

~~Use geodesic eqn (E-L)~~

~~$\frac{d}{ds}$~~

and $G(x^\mu, \dot{x}^\mu) = \left[ g_{\mu\nu} \dot{x}^\mu \dot{x}^\nu \right]^{1/2}$

$$\therefore \quad G = \left[ a^2 \dot{\theta}^2 + a^2 \sin^2\theta \, \dot{\phi}^2 \right]^{1/2}$$

$$= a \left[ \dot{\theta}^2 + \sin^2\theta \, \dot{\phi}^2 \right]^{1/2}$$