1-12. $t_1 = \gamma\left(t_1' + \frac{vx_o'}{c^2}\right)$ $t_2 = \gamma\left(t_2' + \frac{vx_o'}{c^2}\right)$ (from Equation 1-21)

(a) $t_2 - t_1 = \gamma\left(t_2' + \frac{vx_o'}{c^2} - t_1' - \frac{vx_o'}{c^2}\right) = \gamma\left(t_2' - t_1'\right)$

(b) The quantities x_1' and x_2' in Equation 1-21 are each equal to x_o', but x_1 and x_2 in Equation 1-20 are different and unknown.

1-13. (a) $\gamma = 1/(1 - v^2/c^2)^{1/2} = 1/[1 - (0.85c)^2/c^2]^{1/2} = 1.898$

$x' = \gamma(x - vt) = 1.898[75m - (0.85c)(2.0\times10^{-5}s)] = -9.537\times10^3\,m$

$y' = y = 18\,m$

$z' = z = 4.0\,m$

$t' = \gamma(t - vx/c^2) = 1.898[2.0\times10^{-5}s - (0.85c)(75m)/c^2] = 3.756\times10^{-5}\,s$

(b) $x = \gamma(x' + vt') = 1.898[-9.537\times10^3 m + (0.85c)(3.756\times10^{-5}s)] = 75.8\,m$

(difference is due to rounding of γ, x', and t'.

$y = y' = 18\,m$

$z = z' = 4.0\,m$

$t = \gamma(t' + vx'/c^2) = 1.898[3.756\times10^{-5}s + (0.85c)(-9.537\times10^3 m)/c^2]$

$= 2.0\times10^{-5}\,s$

1-14. To show that $\Delta t = 0$ (refer to Figure 1-9 and Example 1-3).

$$t_1 = \frac{L}{\sqrt{c^2 - v^2}} + \frac{L}{\sqrt{c^2 - v^2}} = \frac{2L}{\sqrt{c^2 - v^2}} = \frac{2L}{c}\frac{1}{\sqrt{1 - v^2/c^2}}$$

t_2, because length parallel to motion is shortened, is given by:

$$t_2 = \frac{L\sqrt{1-v^2/c^2}}{c+v} + \frac{L\sqrt{1-v^2/c^2}}{c-v} = \frac{2Lc\sqrt{1-v^2/c^2}}{c^2(1-v^2/c^2)}$$

$$t_2 = \frac{2L}{c}\frac{\sqrt{1-v^2/c^2}}{\left(\sqrt{1-v^2/c^2}\right)^2} = \frac{2L}{c}\frac{1}{\sqrt{1-v^2/c^2}} = t_1$$

Therefore, $t_2 - t_1 = 0$ and no fringe shift is expected.