*12–12.

Traveling with an initial speed of 70 km/h, a car accelerates at 6000 km/h^2 along a straight road. How long will it take to reach a speed of 120 km/h? Also, through what distance does the car travel during this time?

$$v = v_1 + a_c t$$

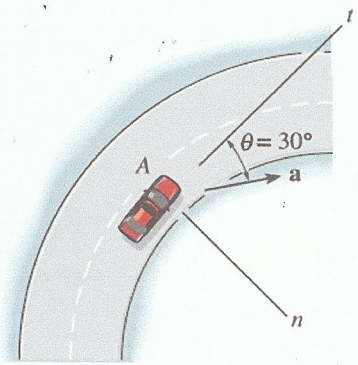
$$120_{km/hr} = 70_{km/hr} + 6000_{km/hr^2}\, t \qquad t = 0.33\times10^{-3}\,hr = 30\,sec$$

$$v^2 = v_1^2 + 2a_c(s - s_1)$$

$$120^2 = 70^2 + 2(6000)(s - 0) \qquad s = 0.792\,km = 792\,m$$

12–114.

The automobile has a speed of 80 ft/s at point A and an acceleration **a** having a magnitude of 10 ft/s^2, acting in the direction shown. Determine the radius of curvature of the path at point A and the tangential component of acceleration.



$$a_t = a\cos 30° = 10\cos 30° = 8.66\,ft/s^2$$

$$a_n = a\sin 30° = 10\sin 30° = 5.00\,ft/s^2$$

$$a_n = \frac{v^2}{\rho} \qquad \rho = \frac{v^2}{a_n} = \frac{80^2}{5.00} = 1280\,ft$$

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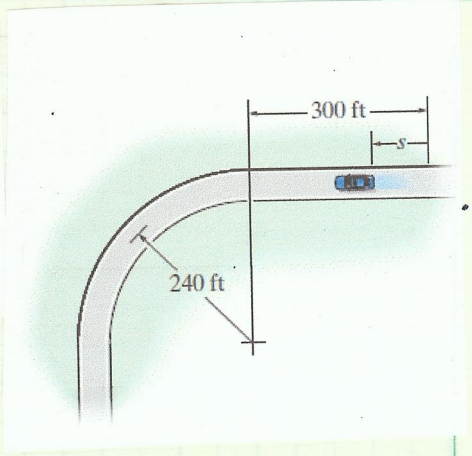
*12–[redacted].

The automobile is originally at rest $s = 0$. If it then starts to increase its speed at $\dot{v} = (0.05t^2)$ ft/s^2, where t is in seconds, determine the magnitudes of its velocity and acceleration at $s = 550$ ft.



$a_t = 0.05t^2$

$\int_0^v dv = \int_0^t 0.05t^2\,dt$

$v = 0.0167t^3$

$\int_0^s ds = \int_0^t 0.0167t^3\,dt$

$s = 0.004167t^4$

$550' = 0.004167t^4$ $\quad t = 19.06$ sec

$v = 0.0167t^3$ $\quad v = 115$ Ft/s

$a_n = \frac{v^2}{\rho} = \frac{115^2}{240} = 55.5$ Ft/s^2

$a_t = 0.05t^2 = 0.05(19.06)^2 = 18.17$ Ft/s^2

$a = \sqrt{55.5^2 + 18.17^2} = 58.4$ Ft/s^2