01) $f(x) = ax^2 - x - 2 \qquad g(x) = x^2 - 5x + 4a$

$f(x) = g(x)$ [ponto de intersecção]

$$f\left(\frac{3}{2}\right) = g\left(\frac{3}{2}\right)$$

$$\frac{9a}{4} - \frac{3}{2} - 2 = \frac{9}{4} - \frac{15}{2} + 4a \qquad x(4)$$

$9a - 6 - 8 = 9 - 30 + 16a$

$7a = 7$

$a = 1$

$f(x) = x^2 - x - 2$ e $g(x) = x^2 - 5x + 4$

$$f\left(\frac{3}{2}\right) = \frac{9}{4} - \frac{3}{2} - 2$$

$$f\left(\frac{3}{2}\right) = -\frac{5}{4}$$

Ponto I $\left(\frac{3}{2}, -\frac{5}{4}\right)$

Vértice de f(x):

$$x_V = \frac{-(-1)}{2\,.\,(1)} \Rightarrow x_V = \frac{1}{2}$$

$$y_V = \frac{-9}{4\,.\,(1)} \Rightarrow y_V = \frac{-9}{4}$$

$v_1 \left(\frac{1}{2}, \frac{-9}{4}\right)$

Vértice de g(x):

$$x_V = \frac{-(-5)}{2\,.\,(1)} \Rightarrow x_V = \frac{5}{2}$$

$$y_V = \frac{-9}{4\,.\,(1)} \Rightarrow y_V = \frac{-9}{4}$$

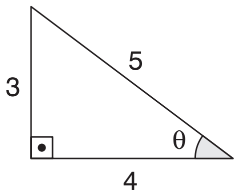
$v_2 \left(\frac{5}{2}, \frac{-9}{4}\right)$

Área do triângulo I $\left(\frac{3}{2}, -\frac{5}{4}\right)$, $v_1 \left(\frac{1}{2}, \frac{-9}{4}\right)$ e $v_2 \left(\frac{5}{2}, \frac{-9}{4}\right)$:

$$S = \frac{1}{2} \,.\, \begin{vmatrix} \frac{3}{2} & -\frac{5}{4} & 1 \\ \frac{1}{2} & -\frac{9}{4} & 1 \\ \frac{5}{2} & -\frac{9}{4} & 1 \end{vmatrix}$$

$$S = \frac{1}{2} \,.\, \left| -\frac{27}{8} - \frac{25}{8} - \frac{9}{8} + \frac{45}{8} + \frac{27}{8} + \frac{5}{8} \right| \Rightarrow S = 1 \text{ u.a.}$$

02) $\text{sen}\,(\theta) = \frac{3}{5} \xrightarrow{\text{SOHCAHTOA}}$



$\rightarrow \cos\theta = \frac{4}{5}$

$\rightarrow \text{tg}\,\theta = \frac{3}{4}$

$$\begin{cases} 6x + y = \frac{7}{16} + \text{tg}^2\,\theta \\ -\frac{5x}{4}\,\text{sen}\,(2\theta) + 3y\,.\,\cos\theta = 5 \end{cases}$$

$$\text{sen}\,2\theta = 2\,.\,\text{sen}\,\theta\,.\,\cos\theta = 2\,.\,\frac{3}{5}\,.\,\frac{4}{5} = \frac{24}{25}$$

$$\begin{cases} 6x + y = \frac{7}{16} + \frac{9}{16} = 1 \\ -\frac{\not{5}}{\not{4}}x\,.\,\frac{\overset{6}{\not{24}}}{\underset{5}{\not{25}}} + 3y\,.\,\frac{4}{5} = 5 \end{cases}$$

$$\begin{cases} 6x + y = 1 \\ -\frac{6x}{5} + \frac{12y}{5} = 5 \end{cases}$$

$$\begin{cases} 6x + y = 1 \\ -6x + 12y = 25 \end{cases}$$

$13y = 26$

$y = 2$

$\rightarrow 6x + 2 = 1$

$6x = -1$

$x = -\frac{1}{6}$

03) Elipse: circunferência $\rightarrow x^2 + y^2 - 6x = 0 \rightarrow C\ (3, 0)$

$P\ (2, \sqrt{27})$ e elipse $\rightarrow e = \dfrac{c}{a} = \dfrac{\sqrt{32}}{6}$ (eixo maior // eixo y)

Elipse: $\dfrac{(x-3)^2}{b^2} + \dfrac{y^2}{a^2} = 1$ $\qquad \dfrac{c^2}{a^2} = \dfrac{32}{36} = \dfrac{8}{9} \rightarrow c^2 = \dfrac{8a^2}{9}$

$\dfrac{(2-3)^2}{b^2} + \dfrac{27}{a^2} = 1 \rightarrow \dfrac{1}{b^2} + \dfrac{27}{a^2} = 1 \rightarrow a^2 = b^2 + c^2$

$\dfrac{1}{b^2} + \dfrac{27}{9b^2} = 1$ $\qquad a^2 = b^2 + \dfrac{8a^2}{9}$

$9 + 27 = 9b^2$ $\qquad 9a^2 = 9b^2 + 8a^2$

$36 = 9b^2$ $\qquad a^2 = 9b^2$

$b^2 = 4$ $\qquad a^2 = 9 . 4$

$b = 2$ $\qquad a^2 = 36$

$a = 6$

Elipse $\rightarrow \dfrac{(x-3)^2}{4} + \dfrac{y^2}{36} = 1$

04) a) $S = S_0 + v . t$

$\Delta S = v . t$

$10 = 10 . t$

$t = 1$ s

b) $F_R = m . a$

$P \text{ sen } 30^\circ = m . a$

$\not{m} . g . \text{sen } 30^\circ = \not{m} . a$

$10 . \dfrac{1}{2} = a$

$a = 5 \text{ m/s}^2$

c) $S = S_0 + v . t$

$\Delta S_{AB} = v_{AB} . t_{AB}$

$8 = v_{AB} . t_{AB}$ $\qquad v_{AB} = v_{0_{BC}}$

$v_{BC} = v_{0_{BC}} + a_{BC} . t_{BC}$ $\qquad t_{AB} = t_{BC}$

$0 = v_{AB} - 4 . t_{AB}$

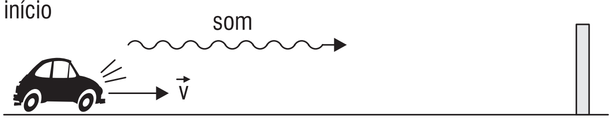
$v_{AB} = 4 . t_{AB}$

$8 = 4 . t_{AB} . t_{AB}$

$2 = t_{AB}^{\ 2}$

$t_{AB} = \sqrt{2}$ s

05) a) início

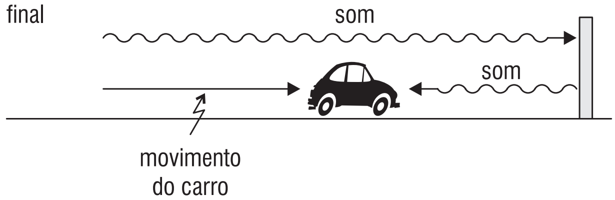


$v_{(carro)} = 122{,}4$ km/h $= 34$ m/s

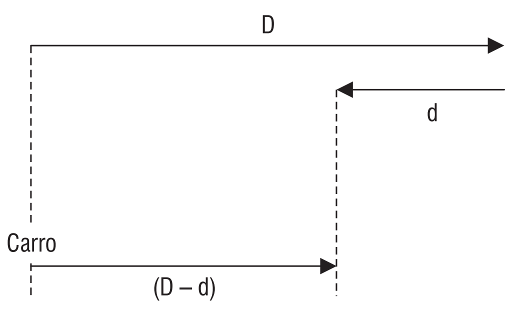
D = ?

t decorrido = 1 s

final



som $\rightarrow$ t = 1 s



$\Delta x = (D + d)$ $\qquad \Delta x = v . t$

$D + d = 340 . 1$

$d = 340 - D$

$\Delta x = (D - d)$ $\qquad \Delta x = v . t$

$D - d = 34 . 1$

$-d = 34 - D$

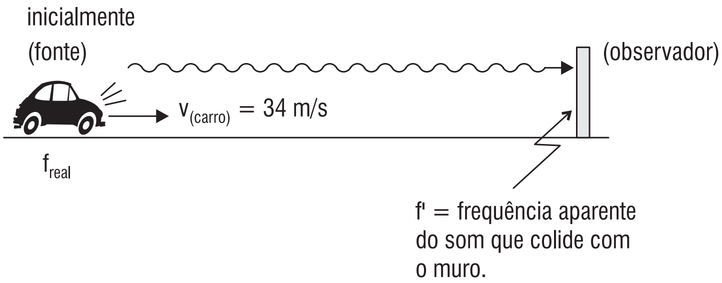
$d = -34 + D$

$d = d$

$340 - D = -34 + D \Rightarrow D = 187$

Resposta: 187 m

b) $f_{aparente} = 840$ Hz
$f_{real} = ?$



$$f' = f\left(\frac{v_s \pm v_0}{v_s \pm v_F}\right)$$

$$\text{aproximação} \Rightarrow f' = f\left(\frac{340 + 0}{340 - 34}\right) \Rightarrow f' = \left(f \,.\, \frac{340}{306}\right)$$

Após o som colidir com o muro e voltar

$$\text{Aproximação} \Rightarrow f'' = f'\left(\frac{v_s \pm v_0}{v_s \pm v_F}\right) \Rightarrow 840 = f \,.\, \left(\frac{340}{306}\right) \,.\, \left(\frac{340 + 34}{340 - 0}\right)$$

f = 687,3

Resposta: 687,3 Hz

06) a) Pela regra da mão direita: a força magnética possui direção vertical e sentido para baixo.
$F = B \,.\, i \,.\, \ell$
$F = 0,2 \,.\, 2 \,.\, 0,3$
$F = 0,12$ N

b) $F_{EF} = F_{MAG} + P$
$K \,.\, x = B \,.\, i \,.\, \ell + m \,.\, g$
$20 \,.\, x = 0,2 \,.\, 1 \,.\, 0,3 + 0,05 \,.\, 10$
$20 \,.\, x = 0,06 + 0,5$
$x = 0,028$ m

c) A mola continua sendo esticada, pois, ao inverter o sentido da corrente e do campo magnético, a força magnética continua sendo vertical e para baixo.