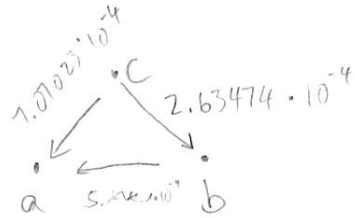
$|da - db| = \cancel{dba - fdoa}$

$\cancel{s} \times \frac{m}{\cancel{s}}$

m (m)



$fdoa = 0.5$

$2.6 \times 10^{-4} \cancel{s} \times \frac{m}{\cancel{s}}$

$x_m - x_1 - (x_2 - x_1)$

speed of sound = 1481 m/s.

grid = 1m

$x_m - x_2$

y-pos - y1 $\quad c = \pm\sqrt{b^2 + a^2}$

ypos - y2 + y1

da

$\sqrt{(x - x_a)^2 + (y - y_a)^2} - \sqrt{(x - x_b)^2 + (y - y_b)^2} = t$

don't need |a| because sequensial.

$(x_1, y_1) \quad (x_2, y_2)$

$\text{center} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

(h, k)

$c = \sqrt{(x_1 - h)^2 + (y_1 - k)^2}$

$f = \sqrt{a^2 + b^2}$

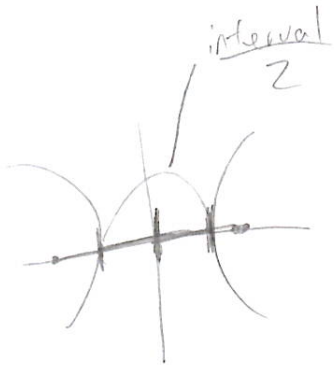
$c^2 = b^2 + a^2$

$\sqrt{x_1 - \cancel{h}}$

$b^2 = c^2 - a^2$

$x -$

$f = \frac{\sqrt{i^2 + j^2}}{2}$



x_m

$2f = \sqrt{i^2 + j^2}$

$x \text{ intercept} = \pm \frac{\text{interval}}{2}$

$4f^2 = i^2 + j^2$

$4f^2 - i^2 = j^2$

s = speed of sound.

$C = (x_C, y_C)$
$A = (x_A, y_A)$
$B = (x_B, y_B)$

$t_{BC} = 2.63474 \cdot 10^{-4}$ = time of arrival to B after C

$t_{AC} = 7.07023 \cdot 10^{-4}$ = time of arrival to A after C

$t_{AB} = t_{AC} - t_{BC}$ = ↗ A from C

$$\begin{cases} \sqrt{(x-x_B)^2+(y-y_B)^2} - \sqrt{(x-x_C)^2+(y-y_C)^2} = st_{BC} \\ \sqrt{(x-x_A)^2+(y-y_A)^2} - \sqrt{(x-x_C)^2+(y-y_C)^2} = st_{AC} \end{cases}$$

$t = \text{sec}$

$$\left(\sqrt{(x-x_B)^2+(y-y_B)^2}\right)^2 = \left(t+\sqrt{(x-x_c)^2+(y-y_c)^2}\right)^2$$

$$(x-x_B)^2+(y-y_B)^2 = t^2+2t\sqrt{(x-x_c)^2+(y-y_c)^2}+(x-x_c)^2+(y-y_c)^2$$

$$x^2-2xx_B+x_B^2+y^2-2yy_B+y_B^2 = t^2+2t\sqrt{(x-x_c)^2+(y-y_c)^2}+x^2-2xx_c+x_c^2+y^2-2yy_c+y_c^2$$

$$2xx_c-2xx_B+x_B^2-x_c^2+2yy_c-2yy_B+y_B^2-y_c^2-t^2 = 2t\sqrt{(x-x_c)^2+(y-y_c)^2}$$

$$\left(2x(x_c-x_B)+2y(y_c-y_B)+(x_B^2-x_c^2+y_B^2-y_c^2-t^2)\right)^2 = \left(2t\sqrt{(x-x_c)^2+(y-y_c)^2}\right)^2$$

$$\underbrace{2x(x_c-x_B)}_{a}+\underbrace{2y(y_c-y_B)}_{b}+\underbrace{(x_B^2-x_c^2+y_B^2-y_c^2-t^2)}_{c}$$

$$(a+b+c)^2 = a^2+b^2+c^2+2ab+2ac+2bc$$

$u = x_c - x_B$

$v = y_c - y_B$

$w = x_B^2 - x_c^2 + y_B^2 - y_c^2 - t^2$

$$(2xu)^2+(2yv)^2+w^2+2(2xu)(2yv)+2(2xu)w+2(2yv)w = 4t^2(x^2-2xx_c+x_c^2+y^2-2yy_c+y_c^2)$$

$$4u^2x^2+(4v^2)y^2+w^2+(8xuv)y+4uwx+(4vw)y = 4t^2x^2-8t^2x_cx+4t^2x_c^2+4t^2y^2-(8t^2y_c)y+4t^2y_c^2$$

$$(4v^2)y^2-(4t^2)y^2+(8xuv)y+(4vw)y+(8t^2y_c)y+(4u^2x^2-4t^2x^2+4uwx+8t^2x_cx+w^2-4t^2x_c^2-4t^2y_c^2)=0$$

$$\underbrace{(4v^2-4t^2)}_{a}y^2+\underbrace{(8xuv+4vw+8t^2y_c)}_{b}y+\underbrace{\left[(4u^2-4t^2)x^2+(4uw+8t^2x_c)x+(w^2-4t^2x_c^2-4t^2y_c^2)\right]}_{c}=0$$

$$y = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$(a-b)^2 = a^2 - 2ab + b^2$

$(b-a)^2 = b^2 - 2ab + a^2$

$\frac{-b_1 \pm \sqrt{b_1^2 - 4a_1c_1}}{2a_1} \qquad \frac{-b_2 \pm \sqrt{b_2^2 - 4a_2c_2}}{2a_1}$

$-2a_2b_1 \pm 2a_2\sqrt{b_1^2 - 4a_1c_1} = -2a_1b_2 \pm 2a_1\sqrt{b_2^2 - 4a_2c_2}$

$\left(\pm 2a_2\sqrt{b_1^2 - 4a_1c_1} \mp 2a_1\sqrt{b_2^2 - 4a_2c_2}\right)^2 = (2a_2b_1 - 2a_1b_2)^2$

$= (2a_2b_1)^2 - 2(2a_2b_1)(2a_1b_2) + (2a_1b_2)^2$

$\left(2a_2\sqrt{b_1^2 - 4a_1c_1}\right)^2 - 2\left(2a_2\sqrt{b_1^2 - 4a_1c_1}\right)\left(2a_1\sqrt{b_2^2 - 4a_2c_2}\right) = 4a_2^2b_1^2 - 8a_1a_2b_1b_2 + 4a_1^2b_2^2$

$+ \left(2a_1\sqrt{b_2^2 - 4a_2c_2}\right)^2$ ↑

$4a_2^2(b_1^2 - 4a_1c_1) - 8a_1a_2\sqrt{(b_1^2 - 4a_1c_1)(b_2^2 - 4a_2c_2)} + 4a_1^2(b_2^2 - 4a_2c_2) =$

$\cancel{4a_2^2b_1^2} - 16a_2^2a_1c_1 + \cancel{4a_1^2b_2^2} - 16a_1^2a_2c_2 - \cancel{4a_2^2b_1^2} + 8a_1a_2b_1b_2 - \cancel{4a_1^2b_2^2} = 8a_1a_2\sqrt{\quad}$

$\underbrace{-16a_2^2a_1c_1}_{b} \underbrace{-16a_1^2a_2c_2}_{c} + \underbrace{8a_1a_2b_1b_2}_{a} = \left(8a_1a_2\sqrt{b_1^2b_2^2 - 4b_1^2a_2c_2 - 4b_2^2a_1c_1 + 16a_1a_2c_1c_2}\right)^2$

$(a-b-c)^2 = a^2 + b^2 + c^2 - 2ab - 2ac + 2bc$

LHS: $(8a_1a_2b_1b_2)^2 + (16a_2^2a_1c_1)^2 + (16a_1^2a_2c_2)^2 - 2(8a_1a_2b_1b_2)(16a_2^2a_1c_1) - 2(8a_1a_2b_1b_2)(16a_1^2a_2c_2) + 2(16a_2^2a_1c_1)(16a_1^2a_2c_2)$

$64a_1^2a_2^2b_1^2b_2^2 + 256a_2^4a_1^2c_1^2 + 256a_1^4a_2^2c_2^2 - 256a_1^2a_2^3b_1b_2c_1 - 256a_2^2a_1^3b_1b_2c_2 + 512a_1^3a_2^3c_1c_2$

RHS: $64a_1^2a_2^2(b_1^2b_2^2 - 4b_1^2a_2c_2 - 4b_2^2a_1c_1 + 16a_1a_2c_1c_2)$

$64a_1^2a_2^2b_1^2b_2^2 - 256a_1^2a_2^3b_1^2c_2 - 256a_1^3a_2^2b_2^2c_1 + 1024a_1^3a_2^3c_1c_2$

RHS − LHS = 0

$-256a_1^2a_2^3b_1^2c_2 - 256a_1^3a_2^2b_2^2c_1 - 256a_2^4a_1^2c_1^2 - 256a_1^4a_2^2c_2^2 + 256a_1^2a_2^3b_1b_2c_1 + 256a_1^3a_2^2b_1b_2c_2 + 512a_1^3a_2^3c_1c_2$

/ by $256a_1^2a_2^2$

$\underbrace{-a_2b_1^2c_2}_{1} \underbrace{-a_1b_2^2c_1}_{2} \underbrace{-a_2^2c_1^2}_{3} \underbrace{-a_1^2c_2^2}_{4} \underbrace{+a_2b_1b_2c_1}_{5} \underbrace{+a_1b_1b_2c_2}_{6} \underbrace{+2a_1a_2c_1c_2}_{7} = 0.$

$a = 4v^2 - 4t^2$

$b = \underbrace{8uvx}_{e} + \underbrace{4vw}_{f}$

$c = \underbrace{(4u^2-4t^2)}_{g}x^2 + \underbrace{(4uw)}_{h}x + \underbrace{w^2}_{k}$

1) $-a_2(e_1x+f_1)^2(g_2x^2+h_2x+k_2) = -a_2(e_1^2x^2+2e_1f_1x+f_1^2)(g_2x^2+h_2x+k_2)$

$= -a_2(e_1^2g_2x^4 + e_1^2h_2x^3 + e_1^2k_2x^2 + 2e_1f_1g_2x^3 + 2e_1f_1h_2x^2 + 2e_1f_1k_2x + f_1^2g_2x^2 + f_1^2h_2x + f_1^2k_2)$

$= \underbrace{-a_2e_1^2g_2}x^4 - \underbrace{a_2e_1^2h_2}x^3 - \underbrace{2a_2e_1f_1g_2}x^3 - \underbrace{a_2e_1^2k_2}x^2 - \underbrace{2a_2e_1f_1h_2}x^2 - \underbrace{a_2f_1^2g_2}x^2$

$- \underbrace{2a_2e_1f_1k_2}x - \underbrace{a_2f_1^2h_2}x - \underbrace{a_2f_1^2k_2}$

2) Same as ① switch all subscript

3) $-a_2^2c_1^2 = -a_2^2(g_1x^2+h_1x+k_1)^2 = -a_2^2(g_1^2x^4 + h_1^2x^2 + k_1^2 + 2g_1h_1x^3 + 2g_1k_1x^2 + 2h_1k_1x)$

$= \underbrace{-a_2^2g_1^2}x^4 - \underbrace{a_2^2h_1^2}x^2 - \underbrace{2a_2^2g_1h_1}x^3 - \underbrace{2a_2^2g_1k_1}x^2 - \underbrace{2a_2^2h_1k_1}x - \underbrace{a_2^2k_1^2}$

4) Same as ③ switch all subscript.

5) $a_2b_1b_2c_1 = a_2(e_1x+f_1)(e_2x+f_2)(g_1x^2+h_1x+k_1) = a_2(e_1e_2x^2 + \underbrace{e_1e_2f_2x + e_2f_1x}_{\hookrightarrow \underbrace{(e_1e_2f_2+e_2f_1)}_{m_1}x} + f_1f_2)(g_1x^2+h_1x+k_1)$

$= \underbrace{a_2e_1e_2g_1}x^4 + \underbrace{a_2e_1e_2h_1}x^3 + \underbrace{a_2e_1e_2k_1}x^2 + \underbrace{a_2m_1g_1}x^3 + \underbrace{a_2m_1h_1}x^2 + \underbrace{a_2m_1k_1}x + \underbrace{a_2f_1f_2g_1}x^2 + \underbrace{a_2f_1f_2h_1}x + \underbrace{a_2f_1f_2k_1}$

6) Same as ⑤ switch all subscript

7) $\underbrace{2a_1a_2}_{n}c_1c_2 = n(g_1x^2+h_1x+k_1)(g_2x^2+h_2x+k_2)$

$= \underbrace{ng_1g_2}x^4 + \underbrace{ng_1h_2}x^3 + \underbrace{ng_1k_2}x^2 + \underbrace{nh_1g_2}x^3 + \underbrace{nh_1h_2}x^2 + \underbrace{nh_1k_2}x + \underbrace{nk_1g_2}x^2 + \underbrace{nk_1h_2}x + \underbrace{nk_1k_2}$

$C = (0, 1)$ $x = 0$

$B = (0.5, 0)$

$\left(\sqrt{a} - \sqrt{b}\right)^2 = c^2$

$a - 2\sqrt{ab} + b = c^2$

$\Downarrow$

$\sqrt{(x-0.5)^2 + y^2} - \sqrt{x^2 + (y-1)^2} = 0.4$

$\sqrt{0.25 + y^2} - \sqrt{(y-1)^2} = 0.4$

$\sqrt{0.25 + y^2} - |y-1| = 0.4$

$\left(x_B^2 + y_B^2\right)\left(x_C^2 + y_C^2\right) = x_B^2 x_C^2 + x_B^2 y_C^2 + y_B^2 x_C^2 + y_B^2 y_C^2$

$\sqrt{0.25 + y^2} = 0.4 + |y-1|$

$(x - x_B)^2 (x - x_C)^2 + ($

$0.25 + y^2 = (y - 0.6)^2$

$(x+a)(y+a)$

$0.25 + y^2 = y^2 - 1.2y + 0.36$

$1.2y = 0.11$

$y =$

$\sqrt{b} - \sqrt{c} = d$

$\sqrt{a} - \sqrt{c} = e$

$\sqrt{a} - \sqrt{b} = f$

$\sqrt{a} - e = \sqrt{c}$

$\sqrt{b} - (\sqrt{a} - e) = d$

$\sqrt{b} - \sqrt{a} + e = d$

$\sqrt{b} - \sqrt{a} = d - e$ $g = d - e$

$\begin{cases} \sqrt{b} - \sqrt{a} = g \\ \quad - \sqrt{a} = f + \sqrt{b} \end{cases}$

$\sqrt{b} - f - \sqrt{b}$

$-f = 2d - e$

$f = e - d$

omg math works
still doesn't solve my problem lol

FAILED ATTEMPT #1

$$\frac{-b_1 \pm \sqrt{b_1^2 - 4a_1c_1}}{2a_1} = \frac{-b_2 \pm \sqrt{b_2^2 - 4a_2c_2}}{2a_2}$$

$$\underbrace{-2a_2 b_1}_{P} \pm \sqrt{\underbrace{b_1^2 - 4a_1c_1}_{d}} = -2a_1b_2 \pm \sqrt{b_2^2 - 4a_2c_2}$$

$$d = b^2 - 4ac$$

$$d = \left(\underbrace{(8uv)}_{j}x + \underbrace{(4vw + 8t^2y_c)}_{k}\right)^2 - 4a\left[\underbrace{(4u^2 - 4t^2)}_{e}x^2 + \underbrace{(4uv + 8t^2x_c)}_{f}x + \underbrace{(w^2 - 4t^2x_c^2 - 4t^2y_c^2)}_{g}\right]$$

$$d = j^2x^2 + 2jkx + k^2 - 4aex^2 - 4afx - 4ag$$

$$d = \underbrace{(j^2 - 4ae)}_{q}x^2 + \underbrace{(2jk - 4af)}_{r}x + \underbrace{(k^2 - 4ag)}_{s}$$

$$P = -2a_2(jx + k)$$

$$P = \underbrace{(-2a_2j)}_{m}x - \underbrace{(2a_2k)}_{n}$$

$$(\sqrt{a} - c)^2 = (\sqrt{d} - \sqrt{b})^2$$

$$a - 2ac + c^2 = d - 2\sqrt{db} + b$$

$$2\sqrt{db} = d + b + 2ac - a - c^2$$

FAILED ATTEMPT

#2