

שאלה 1 פתרון 006

אורך AE : y | מהירות עליה : x
 אורך EB : 70-y | מהירות ירידה : x+10

S	V	t	
y	x	$\frac{y}{x}$	E ← A
70-y	x+10	$\frac{70-y}{x+10}$	B ← E
70-y	x	$\frac{70-y}{x}$	E ← B
y	x+10	$\frac{y}{x+10}$	A ← E

$$\begin{cases} \frac{y}{x} + \frac{70-y}{x+10} = 4.5 \\ \frac{70-y}{x} + \frac{y}{x+10} = 6 \end{cases} \Rightarrow \begin{cases} \cancel{yx} + 10y + 70x - \cancel{xy} = 4.5x^2 + 45x \\ 70x + 700 - \cancel{yx} - 10y + \cancel{yx} = 6x^2 + 60x \end{cases} \Rightarrow$$

$$\Rightarrow \begin{cases} 10y = 4.5x^2 + 45x \\ -10y = 6x^2 - 10x - 700 \end{cases} + \Rightarrow 0 = 10.5x^2 + 35x - 700$$

$$\begin{matrix} 10 & -6\frac{2}{3} \end{matrix}$$

$$\begin{aligned} x &= 10 \\ \Downarrow \\ y &= \frac{6 \cdot (10)^2 - 10 \cdot 10 - 700}{-10} \end{aligned}$$

(א) מהירות עליה: 10 קמ"ש
 (ב) אורך EB : 50 ק"מ

$y = 20$

1 4,00 2 102 006 104

①

$$a_n = n(n+2)$$

הערך $n-1$ הוא זוגי והערך $n+2$ הוא אי-זוגי
 הסדרה היא $1 \cdot 3, 2 \cdot 4, 3 \cdot 5, \dots$
 נניח $n=102$ אז $a_{102} = 102 \cdot 104 = 10608$
 נניח $n=104$ אז $a_{104} = 104 \cdot 106 = 11024$
 הפרש: $11024 - 10608 = 416$

7 4,00

②

$$n(a_{n+4} - a_{n+2}) = 41,600$$

$$a_{n+2} = (n+4)(n+2) \quad ; \quad a_{n+4} = (n+6)(n+4)$$

$$a_{n+4} = (n+6)(n+4)$$

$$\Rightarrow n[(n+6)(n+4) - (n+4)(n+2)] = 41,600$$

נפתור את המשוואה

$$n^2 + 4n - 10,400 = 0 \Rightarrow n_{1,2} = \frac{-4 \pm \sqrt{16 + 41600}}{2}$$

100
הערך הנכון

$n = 100$

$$a_{n+4} = a_{104} = 104 \cdot 106 = \boxed{11,024}$$

$$a_{n+2} = a_{102} = 102 \cdot 104 = \boxed{10,608}$$

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3 תרדן 006 ילול

$$y = \frac{x^2 + 6x + 12}{x^2 - 6x + a}$$

(3)

$\Delta = 0$ קיים פתרון יחיד? לכן

$$36 - 4 \cdot 1 \cdot a = 0$$

$$a = 9$$

$$x = 3$$

$x^2 - 6x + 9 \neq 0$: לא אנכיר: (1) $\Leftrightarrow x \neq 3$

$$y = 1$$

$y = \frac{x^2}{x^2}$: לא אנכיר: \Leftrightarrow

$$(0, \frac{1}{3})$$

$y = \frac{1}{3} \Leftrightarrow y = \frac{12}{9} \Leftrightarrow x = 0$ (2)

$(\Delta < 0)$ אין פתרון לכן $0 = x^2 + 6x + 12 \Leftrightarrow y = 0$

$$y' = \frac{(2x+6)(x^2-6x+9) - (2x-6)(x^2+6x+12)}{(x^2-6x+9)^2} \quad (3)$$

$$y' = \frac{-12x^2 - 6x + 126}{(x^2 - 6x + 9)^2} = 0 \quad \begin{cases} x = -3.5 \\ x = 3 \end{cases}$$

לפי תנאי הבעיה

$$x = -3.5 \Rightarrow y = \frac{1}{13}$$

$$(-3.5, \frac{1}{13})$$

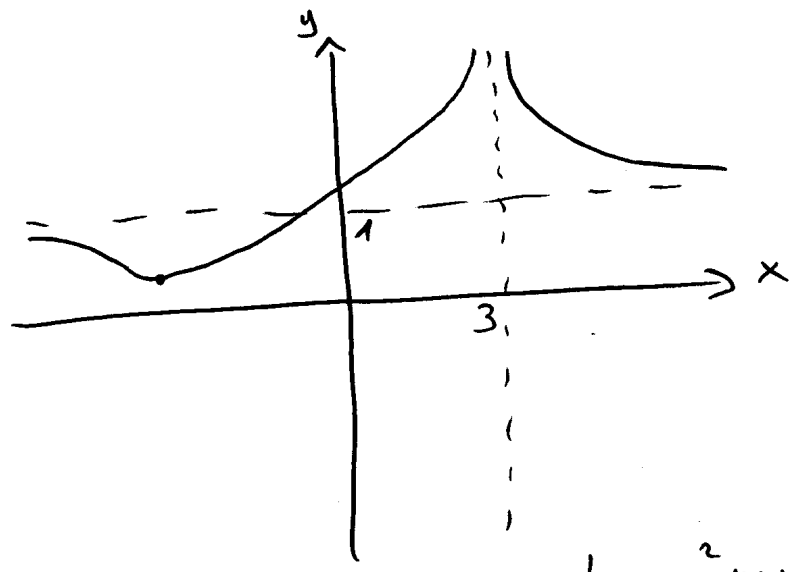
המשך טבלה 3:

X	-4	-3.5	0	3	4
y'	↘		↗		↘

$$y' = \frac{-12x^2 - 6x + 126}{+}$$

טבלה: $-3.5 < x < 3$

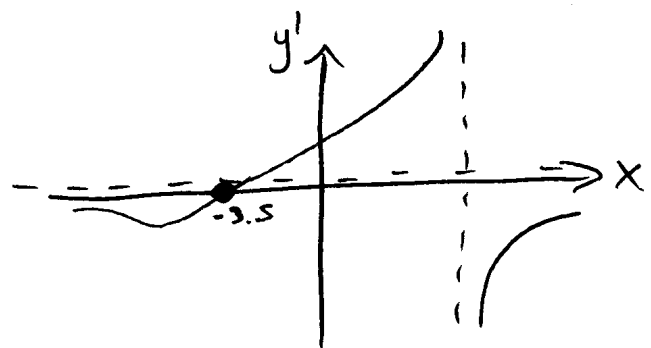
יציבה: $x < -3.5$ ו/או $3 < x$



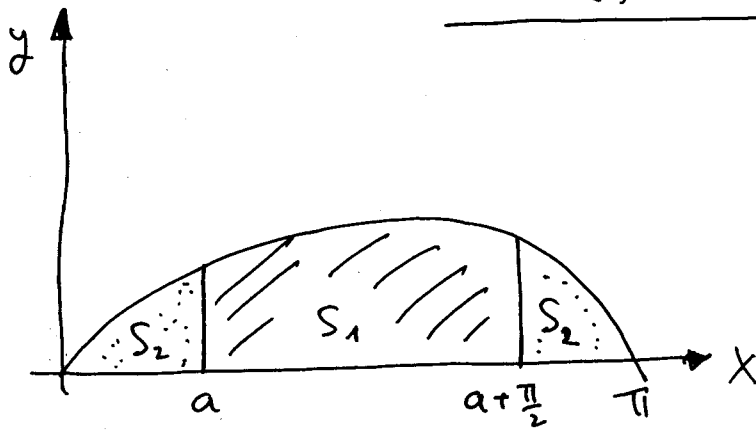
$$y' = \frac{-12x^2 - 6x + 126}{(x^2 - 6x + 9)^2} \quad (2)$$

(1) נוס' אנכית: $x=3$

נוס' מוקפת: $y'=0$ (ה- x בהמשך הטבלה הישנה ביותר...)



4 פתור סוג פרק



$$S_1 + S_2 = \int_0^{\pi} \sin x dx = \left| -\cos x \right|_0^{\pi} = -\cos \pi - (-\cos 0) = 2$$

$$S_1 = \int_a^{a+\frac{\pi}{2}} \sin x dx = \left| -\cos x \right|_a^{a+\frac{\pi}{2}} = -\cos\left(a+\frac{\pi}{2}\right) - (-\cos a)$$

$$S_1 = \cos a - \cos\left(a+\frac{\pi}{2}\right) = \boxed{2 \sin\left(a+\frac{\pi}{4}\right)}$$

cos ה-1/1/3 עברת מ-1/2 ע"י

$$S_2 = (S_1 + S_2) - S_1 = \boxed{2 - 2 \sin\left(a+\frac{\pi}{4}\right) = S_2}$$

$$\frac{S_1}{S_2} = \frac{2 \sin\left(a+\frac{\pi}{4}\right)}{2 - 2 \sin\left(a+\frac{\pi}{4}\right)} = \frac{\sin\left(a+\frac{\pi}{4}\right)}{1 - \sin\left(a+\frac{\pi}{4}\right)}$$

↑ $\cos\left(a+\frac{\pi}{4}\right)$

$$\left(\frac{S_1}{S_2}\right)'(a) = \frac{\cos\left(a+\frac{\pi}{4}\right) \left[1 - \sin\left(a+\frac{\pi}{4}\right)\right] - \left(-\cos\left(a+\frac{\pi}{4}\right)\right) \sin\left(a+\frac{\pi}{4}\right)}{\left[1 - \sin\left(a+\frac{\pi}{4}\right)\right]^2} = 0$$

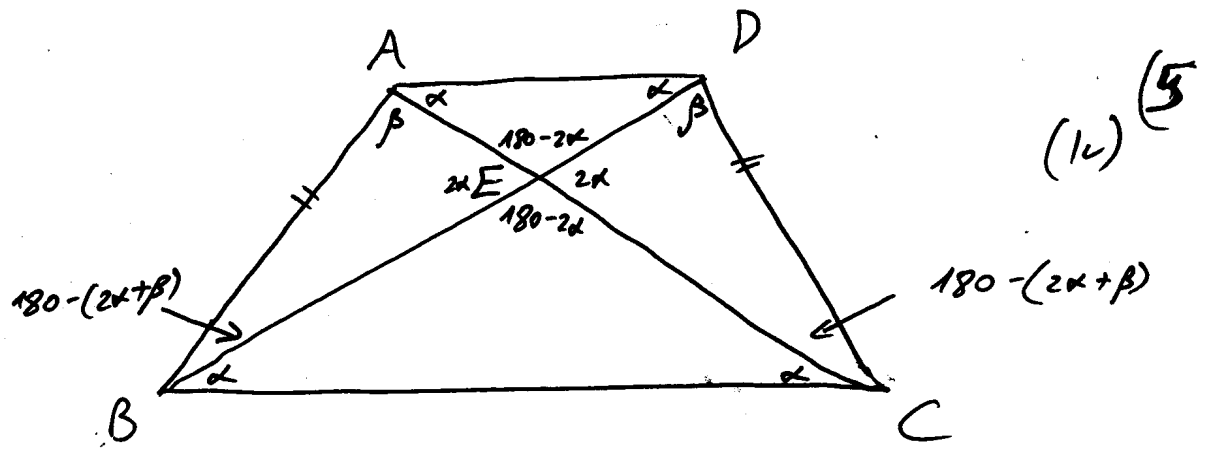
↑ $-\cos\left(a+\frac{\pi}{4}\right)$

(ה-3/1/1) ה'לק' מ'2/2/2

$$\cos\left(a+\frac{\pi}{4}\right) = 0 \Rightarrow a + \frac{\pi}{4} = \frac{\pi}{2}$$

$$\Rightarrow \boxed{a = \frac{\pi}{4}}$$

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(14) (5)

$$S_{\Delta AED} = \frac{x^2 \sin(180-2\alpha)}{2} \Leftarrow AE=x \quad \therefore \Delta AED$$

∴ AEB

$$BE = \frac{x \sin \beta}{\sin(2\alpha + \beta)} \Leftarrow \frac{x}{\sin[180-(2\alpha + \beta)]} = \frac{BE}{\sin \beta}$$

$$S_{\Delta BEC} = \frac{\left(\frac{x \sin \beta}{\sin(2\alpha + \beta)}\right)^2 \cdot \sin(180-2\alpha)}{2}$$

$$S_{\Delta BEC} = \frac{x^2 \sin^2 \beta \cdot \sin 2\alpha}{2[\sin(2\alpha + \beta)]^2}$$

∴ AEB on

$$\frac{S_{\Delta AED}}{S_{\Delta BEC}} = \frac{\frac{x^2 \sin 2\alpha}{2}}{\frac{x^2 \sin^2 \beta \sin 2\alpha}{2 \sin^2(2\alpha + \beta)}} = \frac{\sin^2(2\alpha + \beta)}{\sin^2 \beta} \quad \text{I.C.N}$$

$$S_{\Delta ABE} = \frac{X \cdot X \sin \beta \cdot \sin 2\alpha}{\sin(2\alpha + \beta)} \cdot \frac{1}{2} \quad (7) (5)$$

: \Delta ABE

$$S_{\Delta ABE} = \frac{X^2 \sin \beta \sin 2\alpha}{2 \sin(2\alpha + \beta)}$$

: \Delta BCD

$$S_{\Delta BCD} = S_{\Delta DEC} + S_{\Delta BEC}$$

$$S_{\Delta BCD} = \frac{X^2 \sin \beta \sin 2\alpha}{2 \sin(2\alpha + \beta)} + \frac{X^2 \sin^2 \beta \sin 2\alpha}{2 \sin^2(2\alpha + \beta)}$$

$$S_{\Delta BCD} = \frac{X^2 \sin \beta \sin 2\alpha \cdot \sin(2\alpha + \beta) + X^2 \sin^2 \beta \sin 2\alpha}{2 \sin^2(2\alpha + \beta)}$$

$$S_{\Delta BCD} = \frac{X^2 \sin \beta \sin 2\alpha (\sin(2\alpha + \beta) + \sin \beta)}{2 \sin^2(2\alpha + \beta)}$$

$$\frac{S_{\Delta BCD}}{S_{\Delta ABE}} = \frac{X^2 \sin \beta \sin 2\alpha (\sin(2\alpha + \beta) + \sin \beta)}{2 \sin^2(2\alpha + \beta)} \cdot \frac{2 \sin(2\alpha + \beta)}{X^2 \sin \beta \sin 2\alpha}$$

$$= \frac{\sin(2\alpha + \beta) + \sin \beta}{\sin(2\alpha + \beta)} = \frac{2 \sin \left(\frac{2\alpha + \beta + \beta}{2} \right) \cdot \cos \left(\frac{2\alpha + \beta - \beta}{2} \right)}{\sin(2\alpha + \beta)}$$

$$= \frac{2 \sin(\alpha + \beta) \cos \alpha}{\sin(2\alpha + \beta)} \quad \text{f.e.n}$$

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: 'n '80 '28 (2) (5)

$$\sqrt{\frac{\sin^2(2\alpha + \beta)}{\sin^2\beta}} = \frac{1}{4} \quad \alpha = 30^\circ$$

$$\frac{\sin(2\alpha + \beta)}{\sin\beta} = \frac{1}{4}$$

$$4 \sin 60 \cos \beta + 4 \sin \beta \cos 60 = \sin \beta$$

$$2\sqrt{3} \cos \beta + 2 \sin \beta = \sin \beta$$

$$\sin \beta = -2\sqrt{3} \cos \beta$$

$$\tan \beta = -2\sqrt{3}$$

$$\beta = -73.9 + 180^\circ k$$

$$\Downarrow$$

$\beta = 106.1^\circ$