# Πρόβλημα

Οι ετήσιες πωλήσεις ενός προϊόντος δίνεται

$$S = 50 + 10\eta\mu\frac{\pi t}{6}$$

όπου $t$ χρόνος σε έτη.

με $0 \le t \le 20$.

σε εκατοντάδες χιλιάδες κομμάτια.

(α) Σε πόσο έτος έχουμε 5500 κομμάτια.

→ δηλαδή $S = 5.5$

$$5.5 = 50 + 10\eta\mu\frac{\pi t}{6}$$

$$5 = 10\eta\mu\frac{\pi t}{6}$$

$$\frac{1}{2} = \eta\mu\frac{\pi t}{6}.$$

$$\sin\frac{\pi t}{6} = \frac{1}{2}$$

$$\sin\frac{\pi t}{6} = \sin\frac{\pi}{6}$$

$$\frac{\pi t}{6} = 2k\pi + \frac{\pi}{6} \quad \text{ou} \quad \frac{\pi t}{6} = 2k\pi + \pi - \frac{\pi}{6}$$

$$\pi t = 12k\pi + \pi \qquad \pi t = 12k\pi + 6\pi - \pi$$

$$t = 12k + 1 \qquad t = 12k + 6 - 1$$

$$t = 12k + 5$$

$k = 0$

$t = 1 \rightarrow 2020$

$k = 0$

$t = 5 \quad 2024$

$k = 1$

$t = 13 \rightarrow 2033$

$k = 1$

$t = 17$

$2037$

$$M = |p| + c$$

$$M = |10| + 50 = 60$$

$$60 = 50 + 10 \cos \frac{n\pi}{6}$$

$$10 = 10 \cos \frac{n\pi}{6}$$

$$1 = \cos \frac{n\pi}{6}$$

$$\cos \frac{n}{2} = \cos \frac{n\pi}{6}$$

$$\frac{n\pi}{6} = 2k\pi + \frac{n}{2}$$

~~$$\frac{n\pi}{6} = 2k\pi + n - \frac{n}{2}$$~~

$$n\pi = 12k\pi + 3n$$

$$t = 12k + 3$$

$\frac{k=0}{t=3}$ 2023

$\frac{k=1}{t=15}$ 2035.

# Προβοκα

$$f(x) = \frac{2026}{2\sigma\upsilon\nu x - 1}$$

## Πεδίο ορισμού.

$$2\sigma\upsilon\nu x - 1 = 0$$

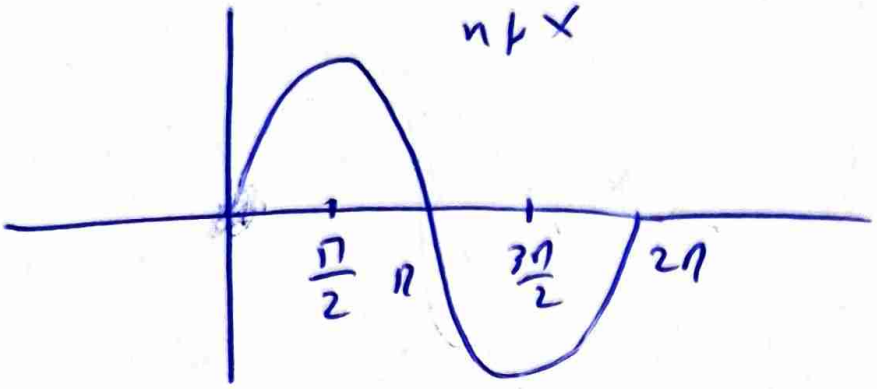
$$\sigma\upsilon\nu x = \frac{1}{2}$$

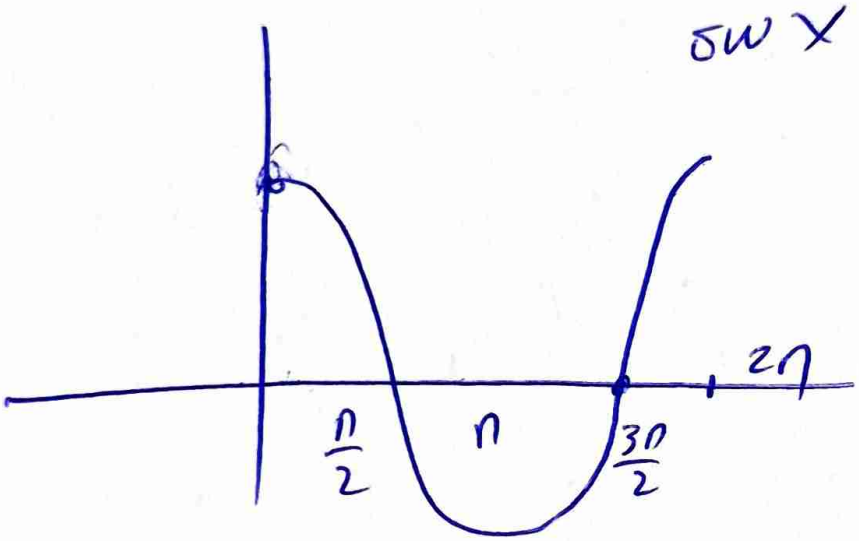
$$\sigma\upsilon\nu x = \sigma\upsilon\nu \frac{\pi}{3}$$

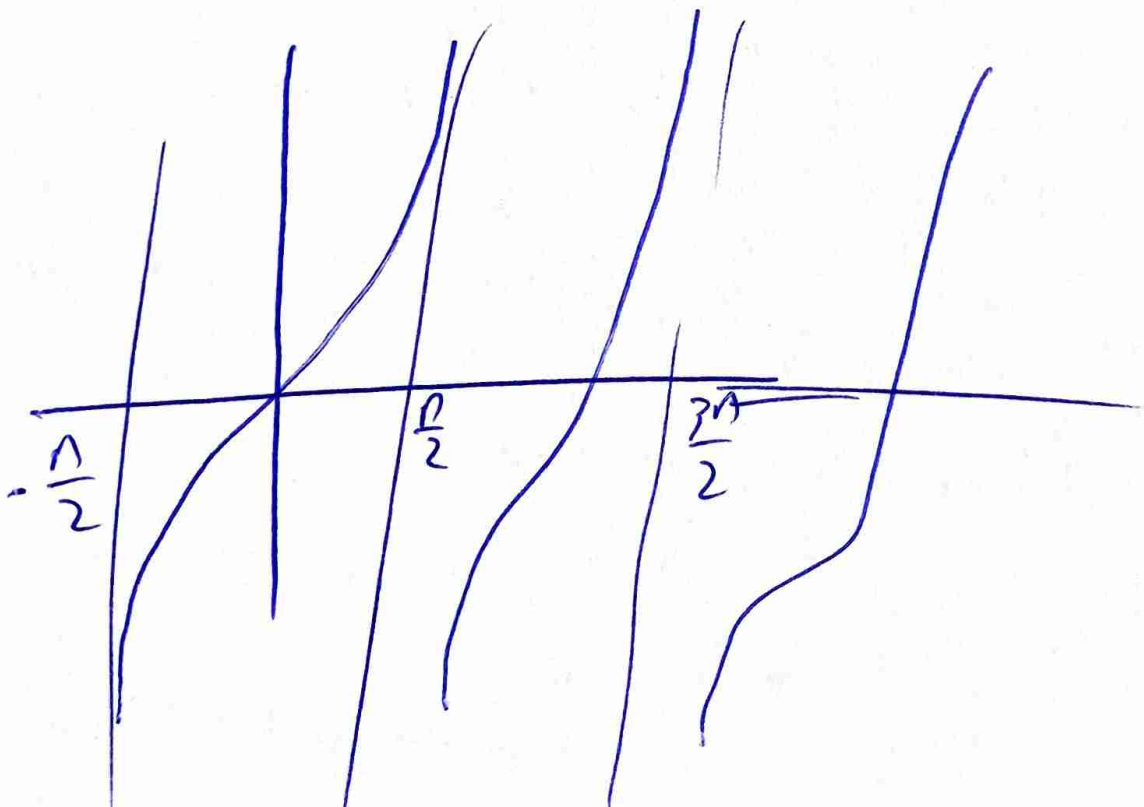
$$x = 2\kappa\pi + \frac{\pi}{3} \quad \text{ή} \quad x = 2\kappa\pi - \frac{\pi}{3}.$$

$$D_f = \left\{ x \in \mathbb{R} \;\middle/\; \begin{array}{l} x \neq 2\kappa\pi + \frac{\pi}{3} \\ x \neq 2\kappa\pi - \frac{\pi}{3} \end{array} \right\}.$$

# Σχήματα



# Пробник

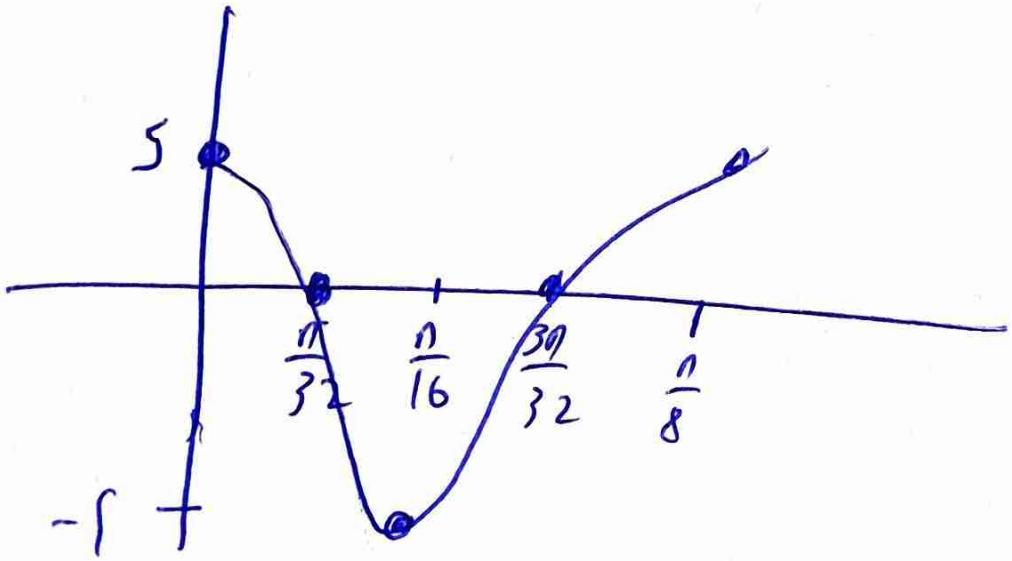
$$f(x) = 5\sin 16x$$

$M = 5$

$m = -5$

$$T = \frac{2\pi}{16} = \frac{\pi}{8}$$

| $16x$ | $0$ | $\frac{\pi}{32}$ | $\frac{\pi}{16}$ | $\frac{3\pi}{32}$ | $\frac{\pi}{8}$ |
|---|---|---|---|---|---|
| $\sin 16x$ | $1$ | $0$ | $-1$ | $0$ | $1$ |
| $f(x)$ | $5$ | $0$ | $-5$ | $0$ | $5$ |



Να λυθεί η ανίσωση

$f(x) \leq 0 \quad \forall x \in (0, \frac{\pi}{8})$.

$\Rightarrow x \in \left(\frac{\pi}{32}, \frac{3\pi}{32}\right)$.

# Πρόβοχι

$$f(x) = \frac{1+\eta\mu x}{\sigma\upsilon\nu^2 x}$$

Αν μετατοπίσω την $f(x)$ κατά $\frac{\pi}{2}$ αριστερά.
Θα πάρω την $g(x)$

Δηλαδή είναι:

$$g(x) = f\left(x+\frac{\pi}{2}\right)$$

$$g(x) = \frac{1+\eta\mu\left(x+\frac{\pi}{2}\right)}{\sigma\upsilon\nu^2\left(x+\frac{\pi}{2}\right)} = \frac{1+\eta\mu\left(\frac{\pi}{2}-(-x)\right)}{\sigma\upsilon\nu^2\left(\frac{\pi}{2}-(-x)\right)}$$

$$g(x) = \frac{1+\sigma\upsilon\nu(-x)}{\eta\mu^2(-x)} = \frac{1+\sigma\upsilon\nu x}{\eta\mu^2 y}$$

Θερμοκρασία

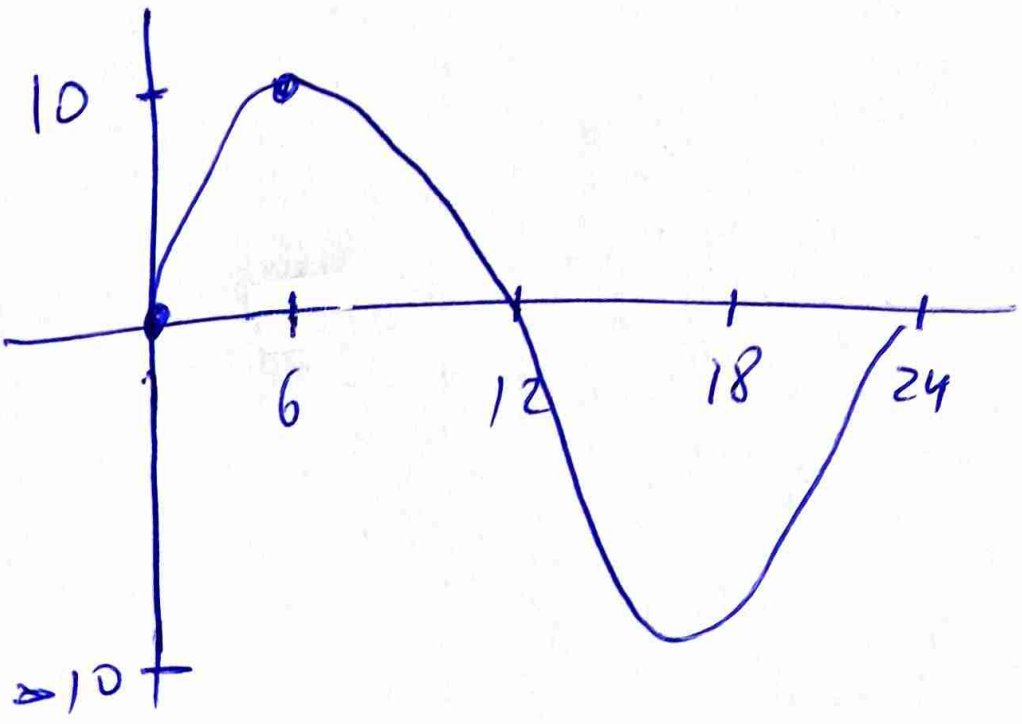
$\Theta = 10 \text{ μ} \frac{\pi t}{12}$ $t$ χρόνος ωρών.

Μεγίστη μεταβολή

$Max - Min = 10 - (-10)$

$= 20$

$T = \frac{2\pi}{\omega} = \frac{2\pi}{\frac{\pi}{12}} = 24$



| | | $\frac{\pi}{6}$ | $\frac{\pi}{4}$ | $\frac{\pi}{3}$ | $\frac{\pi}{2}$ | $\pi$ |
|---|---|---|---|---|---|---|
| $x$ | 0 | 30 | 45 | 60 | 90 | 180 |
| $\sin x$ | 0 | 1/2 | $\frac{\sqrt{2}}{2}$ | $\frac{\sqrt{3}}{2}$ | 1 | 0 |
| $\cos x$ | 1 | $\sqrt{3}/2$ | $\frac{\sqrt{2}}{2}$ | $\frac{1}{2}$ | 0 | -1 |
| $\operatorname{tg} x$ | 0 | $\frac{\sqrt{3}}{3}$ | 1 | $\sqrt{3}$ | - | 0 |
| $\operatorname{ctg} x$ | - | $\sqrt{3}$ | 1 | $\frac{\sqrt{3}}{3}$ | 0 | - |

$$\cos(-x) = \cos x$$

$$\sin(\pi - x) = \sin x$$

$$\operatorname{tg}(\pi + x) = \operatorname{tg} x$$

$\sin x = \sin\vartheta \Leftrightarrow x = 2k\pi + \vartheta$ и $x = 2k\pi + \pi - \vartheta$

$\cos x = \cos\vartheta \Leftrightarrow x = 2k\pi \pm \vartheta$

$\operatorname{tg} x = \operatorname{tg}\vartheta \Leftrightarrow x = k\pi + \vartheta$

$\operatorname{ctg} x = \operatorname{ctg}\vartheta \Leftrightarrow x = k\pi + \vartheta$