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問23

(ア) $3 = 4a$
$a = \frac{3}{4}$

(イ) $AD = 4$ より
$4 \times \frac{1}{3} = \frac{4}{3}$

$E_x = \underbrace{-2}_{A_x} + \frac{4}{3} = -\frac{6}{3} + \frac{4}{3}$
$= -\frac{2}{3}$

$E(-\frac{2}{3}, 3)$

$C(2, -1)$ $E(-\frac{2}{3}, 3)$

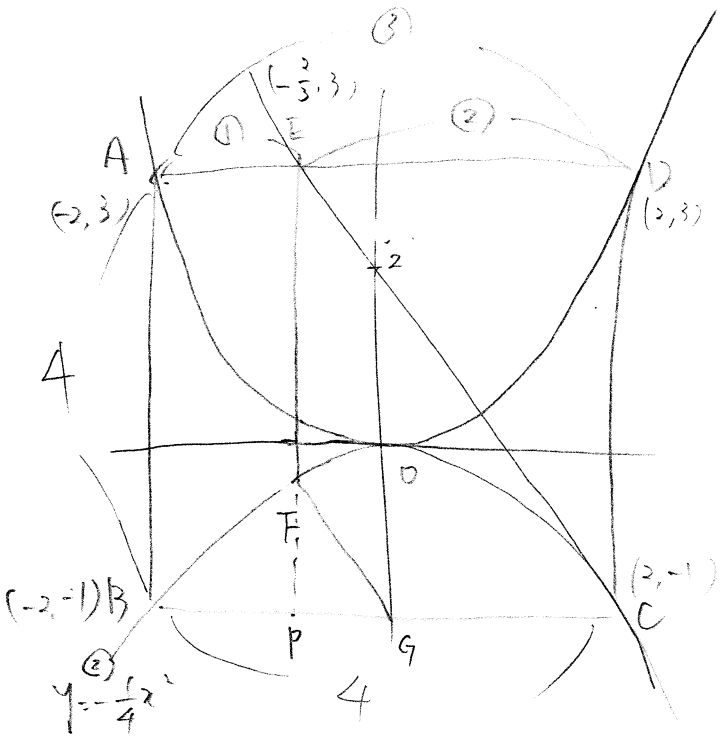
$\begin{cases} -1 = 2a + b \\ 3 = -\frac{2}{3}a + b \end{cases}$

$-4 = \frac{8}{3}a$ $\quad -1 = 2 \times (-\frac{3}{2}) + b$

$a = -4 \times \frac{3}{8}$ $\quad -1 = -3 + b$

$a = -\frac{3}{2}$ $\quad b = 2$

$y = -\frac{3}{2}x + 2$



EFとBCの交点をPとする

$P(-\frac{2}{3}, -1)$

$EP = 3 - (-1) = 4$

$PC = 2 - (-\frac{2}{3}) = \frac{6}{3} + \frac{2}{3} = \frac{8}{3}$

$FP = -\frac{1}{9} - (-1) = \frac{8}{9}$

$PG = \frac{2}{3}$

$\triangle EPC = \frac{8}{3} \times 4 \times \frac{1}{2} = \frac{16}{3}$

$\triangle FPG = \frac{8}{9} \times \frac{2}{3} \times \frac{1}{2} = \frac{8}{27}$

四角形EFGC $= \triangle EPC - \triangle FPG$
$= \frac{16}{3} - \frac{8}{27}$
$= \frac{16 \times 9}{27} - \frac{8}{27}$
$= \frac{144 - 8}{27} = \frac{136}{27}$

(ウ) Fを求める

$y = -\frac{1}{4}x^2$ に $x = -\frac{2}{3}$ を代入

$y = -\frac{1}{4} \times \frac{4}{9}$

$y = -\frac{1}{9}$

$F(-\frac{2}{3}, -\frac{1}{9})$

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問24

(ア) $E_y = 9$ CDのy座標の差が7だから

$E_y = A_y - 7$

$= 16 - 7$

$= 9$

$y = x^2$ に $y = 9$ を代入

$9 = x^2$

$x = \pm 3$ $E_x > 0$ より

$E(3, 9)$

$A_x - E_x = 1$

$D(1, 0)$

(イ) $B(-4, 16)$ $E(3, 9)$

$\begin{cases} 16 = -4a + b \\ 9 = 3a + b \end{cases}$

$7 = -7a$

$a = -1$

$9 = -3 + b$

$b = 12$

$y = -x + 12$

(ウ) $\square ACDE = \triangle CDE \times 2$

EDとy軸の交点をPとする

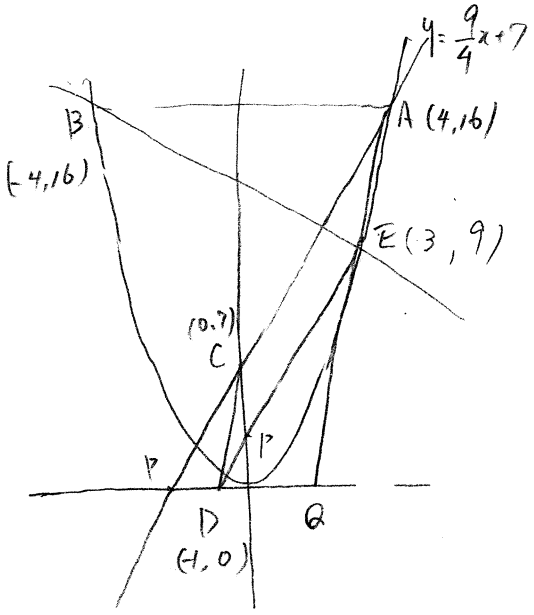
$y = \frac{9}{4}x + b$ に $E(3, 9)$ を代入

$9 = \frac{9}{4} \times 3 + b$

$9 = \frac{27}{4} + b$

$b = \frac{36}{4} - \frac{27}{4}$

$b = \frac{9}{4}$ $P(0, \frac{9}{4})$



$CP = 7 - \frac{9}{4} = \frac{28}{4} - \frac{9}{4}$

$= \frac{19}{4}$

$\triangle CDE = \triangle DCP + \triangle ECP$

$= \frac{19}{4} \times 1 \times \frac{1}{2} + \frac{19}{4} \times 3 \times \frac{1}{2}$

$= \frac{19}{4} \times \frac{1}{2} \times (1 + 3)$

$= \frac{19}{2}$

$\square ACDE = \frac{19}{2} \times 2$

$= 19$

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問25

(ア) A(3,3) を $y=ax^2$ にかく

$3=9a$

$a=\frac{1}{3}$

(イ) A(3,3), B(2,−4) を通る直線

$\begin{cases} 3=3a+b \\ -4=2a+b \end{cases}$ →

$7=a$

$3=21+b$

$b=-18$

$y=7x-18$

(ウ) Cの点を求める

反射の法則 を考える

→ Aから出た光が鏡(y軸)で反射して Bへ到達するときの反射する点がC となる.

Bとy軸について対称な点 B′(−2,4) と A(3,3) を通る直線の切片がCとなる

$\begin{cases} -4=-2a+b \\ 3=3a+b \end{cases}$ →

$-7=-5a$

$a=\frac{7}{5}$

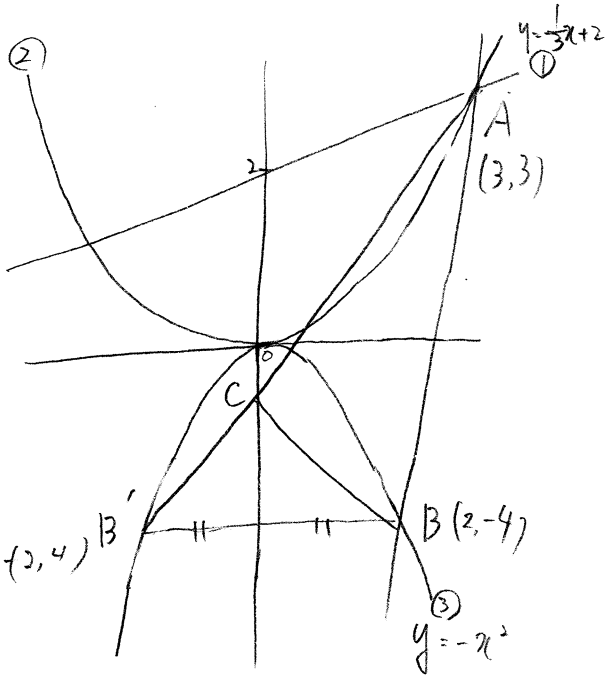
$3=\frac{21}{5}+b$

$b=\frac{15}{5}-\frac{21}{5}$

$=-\frac{6}{5}$

$y=\frac{7}{5}x-\frac{6}{5}$

$C\left(0,-\frac{6}{5}\right)$



$BB'=2-(-2)=4$

Aから BB′ にひいた垂線 $=3-(-4)=7$

Cから BB′ にひいた垂線 $-\frac{6}{5}-(-4)$

$=-\frac{6}{5}+\frac{20}{5}$

$=\frac{14}{5}$

$\triangle ABC=\triangle ABB'-\triangle CBB'$

$=4\times 7\times\frac{1}{2}-4\times\frac{14}{5}\times\frac{1}{2}$

$=4\times\left(7-\frac{14}{5}\right)\times\frac{1}{2}$

$=2\times\left(\frac{35}{5}-\frac{14}{5}\right)$

$=2\times\frac{21}{5}$

$=\frac{42}{5}$