①

(1) ア $\underline{2}$ 　イ $\underline{4}$ 　ウ $\underline{2}$ 　エ $\underline{8}$

オ 色のえらび方 3, ぬり方 2 　　$3\times2=\underline{6}$

カキ 〃 　$3!=6$ 　ぬり方 3. 　　$\underline{18}$

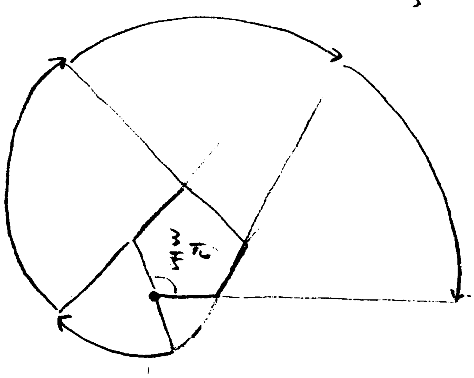
ク

$3+2$ 　　$\underline{6}$ 　　30

$\underline{2.\ 4.\ 2.\ 8.\ 6.\ 1.\ 8.\ 6,\ 3,\ 0}$

(2)

$\underline{\frac{1}{5}l,\ \frac{2}{5}\pi}$



$$\frac{1}{5}l\times\frac{2}{5}\pi+\frac{2}{5}l\times\frac{2}{5}\pi+\cdots+\frac{5}{5}l\times\frac{2}{5}\pi$$

$$=\frac{2}{5}\pi\times\frac{1}{\cancel{5}}\times\cancel{15}^{3}=\underline{\frac{6}{5}l\pi}$$

$$\pi\left(\frac{1}{5}l\right)^2\times\frac{1}{5}+\pi\left(\frac{2}{5}l\right)^2\times\frac{1}{5}$$

$$+\cdots+\pi\left(\frac{5}{5}l\right)^2\times\frac{1}{5}$$

$$=\frac{1}{5}\times\frac{1}{25}\pi\times\frac{1}{\cancel{6}}\times\cancel{5}\times\cancel{6}\times11\,l^2$$

$$=\underline{\frac{11}{25}l^2\pi}$$

正n角形の外角は $\frac{2\pi}{n}$

$$\frac{1}{n}(an+b)l\pi=\sum_{k=1}^{n}\left(\frac{k}{n}l\times\frac{2\pi}{n}\right)=\frac{2l\pi}{n^2}\times\frac{1}{2}n(n+1)=\frac{1}{n}(n+1)l\pi$$

$$\frac{1}{n^2}(cn^2+dn+e)l^2\pi=\sum_{k=1}^{n}\pi\left(\frac{k}{n}l\right)^2\times\frac{\cancel{2\pi}}{\cancel{2\pi}n}=\frac{\pi l^2}{n^3}\times\frac{1}{6}n(n+1)(2n+1)$$

$$=\frac{1}{n^2}\left(\frac{1}{3}n^2+\frac{1}{2}n+\frac{1}{6}\right)\pi l^2$$

$\underline{a=1.\ c=\frac{1}{3}}$

$f l \pi = l\pi$, $g l^2 \pi = \frac{1}{3}\pi l^2$ $\underline{f = 1,\ g = \frac{1}{3}}$ //

$\underline{1,5,2,5,6,5,1,1,2,5,1,1,3,1,1,3}$

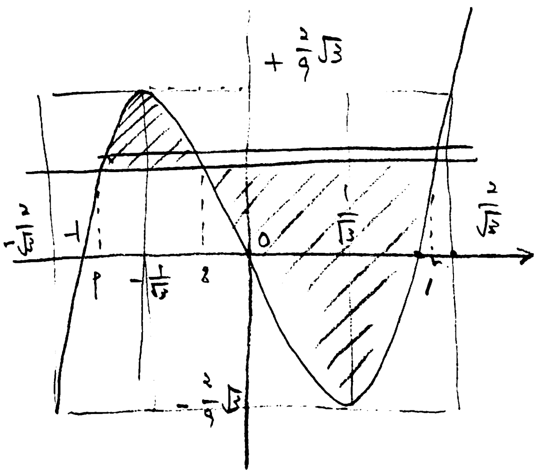
(3)

$f'(x) = 3x^2 - 1$ $x = \pm\frac{1}{\sqrt{3}} = \underline{\pm\frac{\sqrt{3}}{3}}$ //

$f(\pm\frac{1}{\sqrt{3}}) = \pm\frac{1}{3\sqrt{3}} \mp \frac{1}{\sqrt{3}} = \pm\frac{\sqrt{3}}{9} \mp \frac{3\sqrt{3}}{9} = \mp\underline{\frac{2}{9}\sqrt{3}}$ //

$x^3 - x = t$

$x^3 - x - t = 0$



$$\begin{cases} p + q + r = \underline{0} \\ pq + qr + rp = \underline{-1} \\ pqr = t \end{cases}$$

$\Delta G(t) = (r - q) \times \Delta t - (q - p)\Delta t$

$G'(t) \fallingdotseq \frac{\Delta G(t)}{\Delta t} = (r - q) - (q - p)$. $\underline{d}$ //

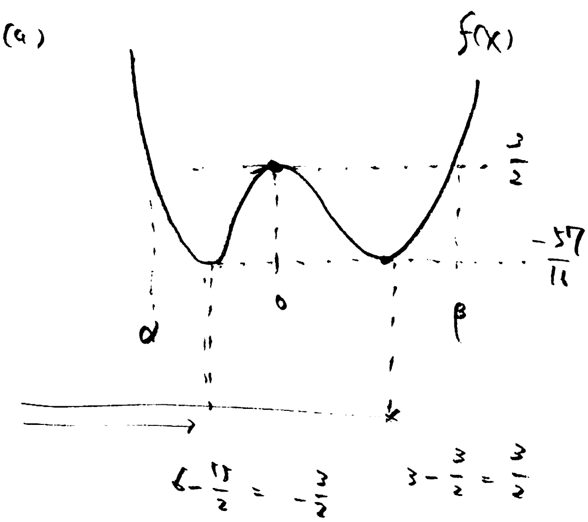
$= r - 2q + p = \underline{-3q}$ // $= 1$. b

$\underline{3, 3, 2, 3, 9, 0, -, 1, d, -, 3, b, 8, 2, 7}$

1.

$q = -\frac{1}{3}$ $G(-\frac{1}{3}) = -\frac{1}{27} + \frac{1}{3} = \underline{\frac{8}{27}}$ //

(a)



$x - t = X$

$f(X)$, $3-t \leqq X \leqq 6-t$

$\alpha = 3-t$, $\beta = 6-t$

$f(0) = c = \frac{3}{2}$

$f(\frac{3}{2}) = \frac{81}{16}a + \frac{9}{4}b + \frac{3}{2} = -\frac{57}{16}$

$f'(x) = 4ax^3 + 2bx$

$f'(\frac{3}{2}) = \frac{27}{2}a + 3b = 0$

$b = -\frac{9}{2}a$ $\qquad \cancel{+4}$ $\quad 24$

$\frac{81}{16}a - \frac{81}{8}a = -\frac{57}{16} - \frac{3}{2}$

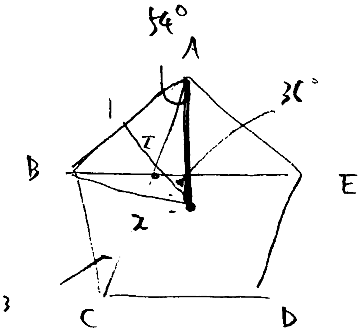
$-\frac{81}{16}a = -\frac{81}{16}$

$a = 1$.

$b = -\frac{9}{2}$, $c = \frac{3}{2}$

1, -9, 2, 3, 2.

②

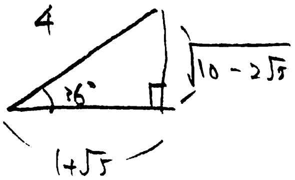


$1 : x = x - 1 : 1$

$x^2 - x - 1 = 0 \qquad x = \frac{1 \pm \sqrt{1+4}}{2} = \underline{\frac{1+\sqrt{5}}{2}}$

$\cos\angle BAC = \underline{\frac{1+\sqrt{5}}{4}} \qquad \sin\angle BAC = \frac{\sqrt{10-2\sqrt{5}}}{4}$

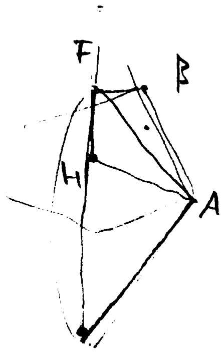
$AB = AH \sin 36^\circ \times 2 = \underline{\frac{1}{2}\sqrt{10-2\sqrt{5}}\ AH}$



$FH^2 + AH^2 = \frac{1}{4}(10-2\sqrt{5})AH^2$

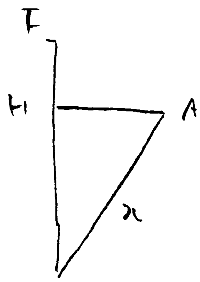
$FH^2 = \frac{6-2\sqrt{5}}{4}AH^2$

$FH = \frac{\sqrt{6-2\sqrt{5}}}{2}AH = \underline{\frac{\sqrt{5}-1}{2}AH}$



$x^2 = \left(x - \frac{\sqrt{5}-1}{2}\right)^2 + 1^2$

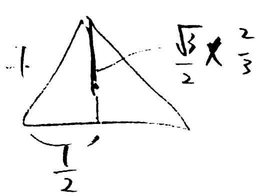
$\cancel{x^2} = \cancel{x^2} - (\sqrt{5}-1)x + \frac{6-2\sqrt{5}}{4} + 1$



$x = \frac{10-2\sqrt{5}}{4} \times \frac{\cancel{1}}{\cancel{\sqrt{5}-1}}\ \frac{\sqrt{5}+1}{4}$

$= \frac{8\sqrt{5}}{16} = \cancel{\frac{\sqrt{5}}{2}AH}$

$IG = \frac{\sqrt{3}}{3}AB = \frac{1}{6}\sqrt{30-2\sqrt{15}}$

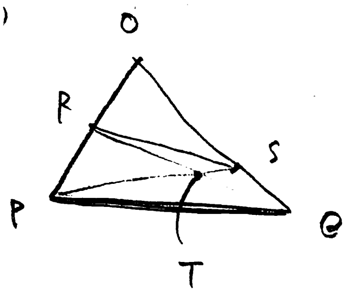


③

(1) $(\text{右辺})^2-(\text{左辺})^2 = (|x|+|y|)^2-|x+y|^2 = x^2+2|xy|+y^2-x^2-2xy-y^2$

$= 2(|xy|-xy) \geqq 0$

(2)



PSとRQの交点をTとする.

△TPQにおいて. 三角形の成立条件より

$PT+TQ \geqq PQ$ …①

△TRSについて

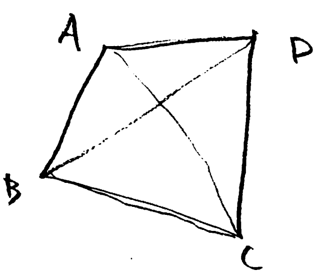
$TR+TS \geqq SR$ …②

①+②

$(PT+TS)+(RT+TQ) \geqq PQ+SR$

$\Leftrightarrow$ $PQ+SR \leqq PS+QR$ 証明終

(3)



三角不等式より

(3) $AB \leqq AC+CB$

$AD \leqq AD+DB$

$CD \leqq CA+AD$

$CD \leqq CB+BD$

これらを辺々足すと

$2AB+2CD \leqq 2AC+2BD+2AD+2BC$

$AB+CD \leqq AC+BD+AD+BC$ 証明終

(4) (3)より CがBD上かつ DがAB上 かつ AがCD上かつ BがCD上 が必要であり. これはABとCDが一致するとき同時に成立する