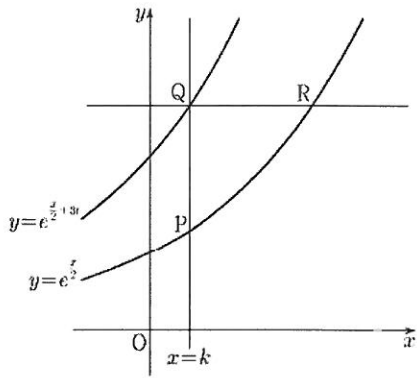


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$$t > 0, P(k, e^{\frac{k}{2}}), Q(k, e^{\frac{k}{2} + 3t}) = Q(k, e^{\frac{k}{2}} \cdot e^{3t}).$$

$$R(\Delta, e^{\frac{k}{2} + 3t}) = R(\Delta, e^{\frac{k+6t}{2}}).$$

$$\therefore \Delta = k + 6t. \text{ 따라서 } \overline{QR} = \overline{PQ} = 6t.$$

$$e^{\frac{k}{2}} \cdot e^{3t} - e^{\frac{k}{2}} = e^{\frac{k}{2}} \cdot (e^{3t} - 1) = 6t.$$

$$\text{이 때 } k = f(t) \text{ 이므로 } e^{\frac{k}{2}} = e^{\frac{f(t)}{2}} = \frac{6t}{e^{3t} - 1}, \therefore f(t) = 2 \ln \left(\frac{6t}{e^{3t} - 1} \right)$$

$$\therefore \lim_{t \rightarrow 0^+} f(t) = \lim_{t \rightarrow 0^+} 2 \ln \left(\frac{\frac{6t}{3t}}{\frac{e^{3t} - 1}{3t}} \right) = 2 \ln 2 = \ln 4 //$$

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$0 \leq \theta < 2\pi$, x 에 대한 이차방정식 $x^2 - (2\sin\theta)x - 3\cos^2\theta - 5\sin\theta + 5 = 0$ 이 실근을 갖는다.

$$\therefore D = 4\sin^2\theta - 4(-3\cos^2\theta - 5\sin\theta + 5) \geq 0.$$

$$\therefore \sin^2\theta + 3 - 3\sin^2\theta + 5\sin\theta - 5 = -2\sin^2\theta + 5\sin\theta - 2$$

$$= (-2\sin\theta + 1)(\sin\theta - 2) \geq 0.$$

$$\therefore \frac{1}{2} \leq \sin\theta \leq 1, (\because -1 \leq \sin\theta \leq 1).$$

$$\text{따라서 } \alpha = \frac{\pi}{6}, \beta = \frac{5\pi}{6}$$

$$\therefore 4\beta - 2\alpha = \frac{20\pi}{6} - \frac{2\pi}{6} = \frac{18\pi}{6} = 3\pi //$$

