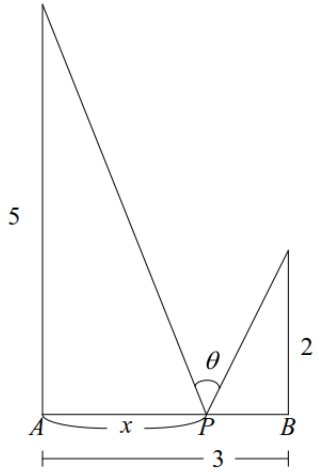
May 5th

1. Choose the point P on the line segment AB so as

(1) to maximize the angle θ;

(2) to minimize the angle θ.



2. Find the following indefinite integrals:

(1) $\int \frac{3t^2+t+4}{t^3+t}\,dt$ (2) $\int \cos\sqrt{x}\,dx$

3. Evaluate $\lim_{x\to 0}\frac{1}{x}\int_0^x (1-\tan t)^{\frac{1}{t}}\,dt$.

4. $\lim_{x\to\infty}\frac{\ln(1+x)}{\ln(1+x^2)} =$ _____

5. (1) $\int x\sin^{-1}x\,dx$ = _____ (2)$\int \frac{\ln x}{x\ln x+x}dx$ = _____

6. $5\sin\theta + 12\cos\theta = 0$, $\frac{3}{2}\pi < \theta < 2\pi$.

(1)$\tan 2\theta$ = _____ (2)$\cos\frac{\theta}{2}$ = _____

7. $\sin\theta + \cos\theta = \frac{1}{5}$, $\frac{3}{2}\pi < \theta < 2\pi$, $\cos\theta$ = _____

8. $\cos 2\theta = \frac{3}{5}$, $\sin 2\theta < 0$, $\tan\theta + \cot\theta$ = _____

9. 設 $x\in R$, $f(x) = 2 + \sin x + \cos x - \sin 2x$,

(1)令 $t = \sin x + \cos x$，請以 t 表示 $f(x)$ = _____ (2)求 f(x)之最小值為_____

10. 在△ABC 中，若$\frac{\sin 2A}{\sin B} = \frac{\cos A}{\cos C}$，試判斷此三角形的形狀。

1. (1) $x = 5 - 2\sqrt{5}$ (2) $x = 3$

2. (1) $4\ln|t| - \frac{1}{2}\ln(t^2+1) + \tan^{-1}t + C$ (2) $2\sqrt{x}\sin\sqrt{x} + 2\cos\sqrt{x} + C$

3. $\frac{1}{e}$ **4.** $\frac{1}{2}$ **5.** (1) $\frac{x^2}{2}\sin^{-1}x - \frac{1}{4}\sin^{-1}x + \frac{x}{4\sqrt{1-x^2}} + C$ (2) $\ln x - \ln(1+\ln x) + C$

6. (1)$\frac{120}{119}$ (2)$-\frac{3}{\sqrt{13}}$ **7.** $\frac{4}{5}$ **8.**$-\frac{5}{2}$

9. (1) $-t^2 + t + 3$, $-\sqrt{2} \le t \le \sqrt{2}$ (2) $1-\sqrt{2}$ **10.** 等腰或直角三角形