

Department :

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단답형: (1번~5번) 단답형의 답은 페이지 하단에 주어진 네모 칸에 써야 점수 인정받습니다. 주의할 것.

1.(6 pts) Find an equation of the tangent line to the curve

$$y + x \cosh y + 2e^y = x^2 y$$

at  $y=0$ .

2.(6 pts) Find the limit, if it exists.

$$\lim_{x \rightarrow \infty} 3x^{\frac{3}{2}} \left( \sin \frac{1}{\sqrt{x}} - \frac{1}{\sqrt{x}} \right)$$

※ Evaluate the following integrals. (3~5)

3.(6 pts)  $\int_0^{\pi/4} \sec^2 t (\sec t + \tan t) dt$

4.(6 pts)  $\int_0^1 \frac{\ln x}{\sqrt{x}} dx$

5.(6 pts)  $\int_e^{\infty} \frac{\ln x}{x^2} dx$

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단답형: (6번~10번) 단답형의 답은 페이지 하단에 주어진 네모 칸에 써야 점수 인정받습니다. 주의할 것.

6.(6 pts) Let  $f(x) = \frac{d}{dx} [\cosh^{-1}(\sqrt{1 + \sin^2 x})]$ .

Find  $f\left(\frac{\pi}{6}\right)$ .

7.(6 pts) Find the slope of the tangent line to the parametric curve

$$x = (1-t)e^t, \quad y = 2t \sinh t$$

at  $t = 0$ .

8.(6 pts) For what values of  $t$  is the parametric curve concave downward?

$$x = t^2 + 1, \quad y = t^2 + t$$

9.(6 pts) Find the points on the polar curve

$$r = 1 + \cos \theta$$

where the tangent line is horizontal.

(답은 극좌표  $(r, \theta)$ 로 표시하시오)

10.(6 pts) Approximate the sum of the series

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{(2n+1)!}$$

correct to  $|error| \leq 0.002$ . (합산은 안 해도 됩니다)

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서술형: (11번~12번) 풀이 과정을 자세히 기술해야 합니다.

11.(15 pts) Evaluate

$$\lim_{x \rightarrow 0^+} \left( \frac{x^3 \tan^{-1}\left(\frac{1}{x}\right)}{\sin^{-1}x} + (\tan 2x)^x \right).$$

12.(15 pts) Evaluate the following integrals.

(a)  $\int_0^1 \frac{x^3}{(x^2 + 4)^{3/2}} dx$

(b)  $\int \frac{5}{(e^x - 2)\cosh x} dx$

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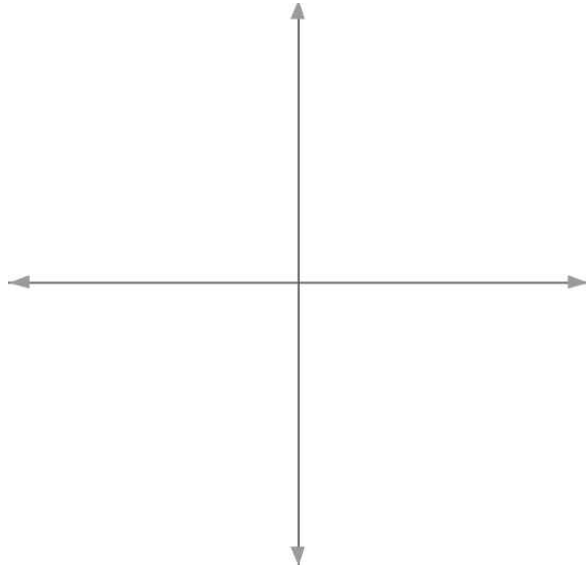
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서술형: (13번~14번) 풀이 과정을 자세히 기술해야 합니다.

13.(15 pts)

- (a) Sketch the polar graph  $r^2 = 2\cos 4\theta$ .  
(b) Evaluate the area of the region inside the given polar curve  $r^2 = 2\cos 4\theta$  and outside the circle  $r = 1$ .

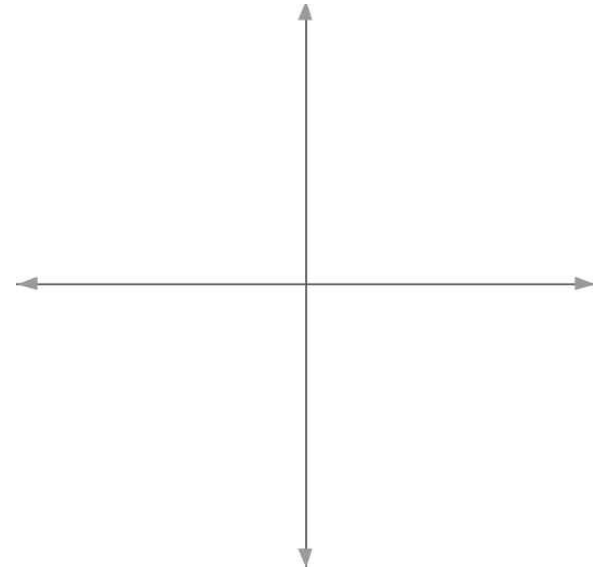
sol) (a) 아래 좌표축 위에 그리시오



14.(15 pts)

- (a) Sketch the polar graph  $r = \frac{1}{2} - \cos 2\theta$ .  
(b) Find all points of intersection of the polar curves  $r = \frac{1}{2} - \cos 2\theta$  and  $r = \frac{1}{2}$ .  
(답은 극좌표  $(r, \theta)$ 로 표시하시오)

sol) (a) 아래 좌표축 위에 그리시오



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서술형: (15번~16번) 풀이 과정을 자세히 기술해야 합니다.

15.(15 pts)

Determine whether the series is absolutely convergent, conditionally convergent or divergent.

(1)  $\sum_{n=2}^{\infty} \frac{(-1)^n}{n\sqrt{\ln n}}$

(2)  $\sum_{n=1}^{\infty} (-1)^{n+1} \left( n \sin \frac{1}{\sqrt{n}} \right)$

(3)  $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{2 \times 4 \times 6 \times \dots \times (2n)}{2 \times 5 \times 8 \times \dots \times (3n-1)}$

16.(15 pts) Consider the series

$$\frac{1}{3} + \sum_{n=1}^{\infty} \frac{\tan^{-1} n}{n^2 + 1} (3x)^n.$$

(a) Find the radius of convergence of the series.

(b) For what values of  $x$  does the series converge?