Calculus I [MATH 161 (01~04)]

Department :

Id number :

Name :

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

1.(6 pts.) Find the first 3 nonzero terms of the Maclaurin series for $f(x) = (\tan^{-1} x)^2$.

2.(6 pts.) Find the minimum value of A + B that satisfies $4(\ln 2)^2 = 8(\ln 2)^3 = A$

$$1 - 2\ln 2 + \frac{4(\ln 2)}{2!} - \frac{6(\ln 2)}{3!} + \dots = \frac{\pi}{B}$$

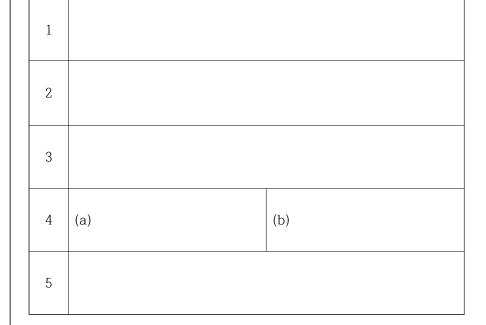
where A and B are natural numbers.(자연수)

3.(6 pts.) If the angle between the vectors \boldsymbol{a} and \boldsymbol{b} is $\frac{\pi}{4}$ and $\boldsymbol{a} \times \boldsymbol{b} = \langle \sqrt{5}, -2, 4 \rangle$, find | proj_a $\boldsymbol{b} \times \text{proj}_{\boldsymbol{b}} \boldsymbol{a}$ |.

4.(6 pts.) Let *L* be the line of intersection of the planes 3x - y - 2z = 1 and 2x + y - 2z = -1.

- (a) Find parametric equations for the line L.
- (b) Find the distance from the point (2,0,2) to L.

5.(6 pts.) Find parametric equations for the tangent line to the space curve obtained by taking intersection of the cylinder $x^2 + 4y^2 = 9$ and the plane x - y + z = 0 at the point (3, 0, -3).



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

6.(6 pts.) If z is defined implicitly as a function of x and y by the equation $e^{xyz} = \ln[x^2z(y+1)]$, find $\frac{\partial z}{\partial x}$ when (x,y) = (1,0).

7.(6 pts.) Find the directional derivative of the function $f(x, y, z) = \sin(xy) + yz$ at the point $\left(0, -\frac{\pi}{3}, \frac{\pi}{3}\right)$ in the direction of the vector v = 3j + 4k.

8.(6 pts.) Find an equation of the tangent plane of the surface $x^y + y^x + \tan^{-1}(x^2 + y^3 + z) = 2$ at the point (1,1,-2).

9.(6 pts.) The functions a(x), b(x) and c(x) satisfy

$$\int_{0}^{2} \int_{y^{2}}^{y+2} f(x) \, dx \, dy$$

= $\int_{0}^{2} \int_{0}^{\boxed{a(x)}} f(x) \, dy \, dx + \int_{2}^{4} \int_{\boxed{b(x)}}^{\boxed{c(x)}} f(x) \, dy \, dx.$

Find g(9), if $g(x) = a(x) - b(x) + [c(x)]^2$.

10.(6 pts.) Find the volume of the solid in the first octant that is bounded by the cylinders $x^2 + z^2 = 4$, $3z - x^2 = 0$ and the planes x = 0, y = 0 and y = z.



서술형: (11번~16번) 풀이 과정을 자세히 기술해야 합니다.

11.(15 pts.) Let $f(x, y) = \sum_{n=0}^{\infty} \frac{y^{2n+2}}{(2n+1)!} x^n$. (a) Find the value of $f\left(-1, \frac{\pi}{6}\right)$. (b) Find the value of $g^{(4)}(0)$ if $g(x) = f_{yx}(x, -1)$. 12.(15 pts.) Let L_1 and L_2 be the lines

$$L_1 : x = 2t, \quad y = 0, \quad z = -t$$
$$L_2 : \frac{x-1}{3} = \frac{y+1}{2} = \frac{z-2}{1}$$

(a) Find the value of $\cos \theta$ ($0 \le \theta \le \pi$) where θ is the angle between the directional vectors of L_1 and L_2 . (b) Show that the lines L_1 and L_2 are skew.

(c) Find the distance between $L_1 \ {\rm and} \ L_2\,.$

Department :	Id number :	Name :
13.(15 pts.) Let P be a parallelo edges a, b, c are parallel to the $v_b = \langle 1, 0, -1 \rangle$ and $v_c = \langle 0 \rangle$ and z , respectively. (a) Find the volume of P as a fr (b) Find the maximum value of $x + y + z = 12$.	vectors $\boldsymbol{v}_a = \langle -1, 2, 2 \rangle$,), $-1, 1 \rangle$ with lengths x, y unction of x, y and z .	14.(15 pts.) Find the maximum and minimum values of $f(x, y, z) = xyz$ on $x^2 + y^2 + z^2 \le 1$.

15.(15 pts.) Let $f(x, y) = x^3 + 3xy^2 - 15x + y^3 - 15y$. (a) Find all critical points of f(x, y). (b) Find the local maximum and minimum values, and

saddle point(s) of f(x, y).

16.(15 pts.) Evaluate the following double integrals.

(a)
$$\int_{-1}^{1} \int_{|y|}^{1} e^{1+x^2} dx dy.$$

(b) $\int_{0}^{2} \int_{\sin^{-1}\left(\frac{y}{2}\right)}^{\frac{\pi}{2}} \frac{1}{2+2\cos^2 x} dx dy.$