MA201 Final Exam Practice Ch 11 - 14

Name___________________________________

Solve the problem.

1) Find parametric equations for the normal line to the surface $z = 5x^2 - 2y^2$ at the point $(2, 1, 18)$.

2) Find the equation for the tangent plane to the surface $z = -9x^2 - 3y^2$ at the point $(2, 1, -39)$.

3) Write parametric equations for the tangent line to the curve of intersection of the surfaces $x + y + z = 9$ and $x - y + 2z = 11$ at the point $(1, 2, 6)$.

Find the absolute maxima and minima of the function on the given domain.

4) $f(x, y) = x^2 + 8x + y^2 + 14y + 2$ on the rectangular region $-1 \le x \le 1$, $-2 \le y \le 2$

Find all the local maxima, local minima, and saddle points of the function.

5) $f(x, y) = (x^2 - 25)^2 + (y^2 - 16)^2$

Find the volume under the surface z = f(x,y) and above the rectangle with the given boundaries.

6) $z = 8x + 4y + 7$; $0 \le x \le 1$, $1 \le y \le 3$

Reverse the order of integration and then evaluate the integral.

7) $\displaystyle\int_0^{392} \int_{\sqrt{y/8}}^{7} \frac{\sin x^2}{x}\, dx\, dy$

8) $\displaystyle\int_1^{4} \int_{\sqrt{y}}^{2} \sin\left(\frac{x^3}{3} - x\right) dx\, dy$

Find the area of the region specified in polar coordinates.

9) one petal of the rose curve $r = 3 \cos 3\theta$

Find the volume of the indicated region.

10) the region bounded by the cylinder $x^2 + y^2 = 4$ and the planes $z = 0$ and $x + z = 7$

11) the region bounded by the coordinate planes, the parabolic cylinder $z = 36 - x^2$, and the plane $y = 3$

12) the region enclosed by the paraboloids $z = x^2 + y^2 - 2$ and $z = 198 - x^2 - y^2$

13) $\displaystyle\int_0^{6} \int_0^{y} x\, dx\, dy$

The position vector of a particle is r(t). Find the requested vector.

14) The velocity and acceleration at $t = \frac{\pi}{8}$ for $\mathbf{r}(t) = (7 \sin 4t)\mathbf{i} - (9 \cos 4t)\mathbf{j} + (2 \csc 4t)\mathbf{k}$

For the smooth curve r(t), find the parametric equations for the line that is tangent to r at the given parameter value $t = t_0$.

15) $\mathbf{r}(t) = (7 \sin t)\mathbf{i} - (3 \cos 4t)\mathbf{j} + e^{-10t}\mathbf{k}$; $t_0 = 0$

Find T, N, and B for the given space curve.

16) $\mathbf{r}(t) = (\ln(\cos t) + 2)\mathbf{i} + 3\mathbf{j} + (8 + t)\mathbf{k}$, $-\pi/2 < t < \pi/2$

Find f_x, f_y, and f_z.

17) $f(x, y, z) = \sin(xy) \cos(yz^2)$

Solve the problem.

18) Evaluate $\frac{dw}{dt}$ at $t = 6$ for the function $w = e^y - \ln x$; $x = t^2$, $y = \ln t$.

Find the derivative of the function at P_0 in the direction of u.

19) $f(x, y) = \ln(6x + 2y)$, $P_0(-8, 3)$, $\mathbf{u} = 6\mathbf{i} + 8\mathbf{j}$

Solve the problem.

20) Write an equation for the tangent line to the curve $x^2 - 9xy + y^2 = 11$ at the point $(-1, 1)$.

Find the area of the region specified by the integral(s).

21) $\displaystyle\int_0^{9} \int_{9-x}^{e^x} dy\, dx$

Use a spherical coordinate integral to find the volume of the given solid.

22) the solid between the spheres $\varrho = 5 \cos \varphi$ and $\varrho = 8 \cos \varphi$

1) $x = 20t + 2,\ y = -4t + 1,\ z = -t + 18$
2) $-36x - 6y - z = -39$
3) $x = 3t + 1,\ y = -t + 2,\ z = -2t + 6$
4) Absolute maximum: 43 at (1, 2); absolute minimum: −29 at (−1, −2)
5) $f(0, 0) = 881$, local maximum; $f(0, 4) = 625$, saddle point; $f(0, -4) = 625$, saddle point; $f(5, 0) = 881$, saddle point; $f(5, 4) = 0$, local minimum; $f(5, -4) = 0$, local minimum; $f(-5, 0) = 256$, saddle point; $f(-5, 4) = 0$, local minimum; $f(-5, -4) = 0$, local minimum
6) 38
7) $4(1 - \cos 49)$
8)
9) $\frac{3}{4}\pi$
10) 28π
11) 432
12) $10{,}000\pi$
13)
14) $\mathbf{a}\left(\frac{\pi}{8}\right) = -112\mathbf{i} + 32\mathbf{k}$
15) $x = 7t,\ y = -3,\ z = 1 - 10t$
16) $\mathbf{T} = (-\sin t)\mathbf{i} + (\cos t)\mathbf{k}$; $\mathbf{N} = (-\cos t)\mathbf{i} - (\sin t)\mathbf{k}$; $\mathbf{B} = -\mathbf{j}$
17) $f_x = y \cos (xy) \cos (yz^2)$; $f_y = x \cos (xy) \cos (yz^2) - z^2 \sin (xy) \sin (yz^2)$; $f_z = -2yz \sin (xy) \sin (yz^2)$
18) $\frac{2}{3}$
19) $-\frac{13}{105}$
20) $x - y + 2 = 0$
21) $e^9 - \frac{83}{2}$
22) $\frac{129}{2}\pi$