① Find f_x, f_y f_{xy} f_{xx} f_{yy} for $f(x,y) = \sin^2(x-3y)$.
(#17 on 14.3)

② Find $\frac{\partial w}{\partial r}$ if $w = (x+y+z)^2$ $x = r-s$ $y = \cos(r+s)$ $z = \sin(r+s)$
(#33 on 14.4)

③ Find directional derivative $f(x,y) = \frac{x-y}{xy+2}$ $\vec{u} = 12\vec{i} + 5\vec{j}$ at $P_0(1,-1)$
(#13 on 14.5)

④ Find the directions that f increase most rapidly, decrease most rapidly
(#20 on 14.5) $f(x,y) = x^2y + e^{xy}\sin y$ at $P_0(1,0)$

⑤ Find tangent plane and normal line of
(#4 on 14.6) $x^2 + 2xy - y^2 + z^2 = 7$ at $P_0(1,-1,3)$.

⑥ Find <u>tangent line</u> of the intersection line between the two surfaces
(#14 on 14.6) $xyz = 1$, $x^2 + 2y^2 + 3z^2 = 6$ at pt $(1,1,1)$.

⑦ Find absolute extreme values of
(#34 on 14.7) $T(x,y) = x^2 + xy + y^2 - 6x$ on $0 \le x \le 5$ $-3 \le y \le 3$.

⑧ Find $\int_1^4 \int_0^4 \left(\frac{x}{z} + \sqrt{y}\right) dx\,dy$.

$\iint_R \frac{\sqrt{x}}{y^2} dA$ $R: 0 \le x \le 4$ $1 \le y \le 2$
(#5 on 15.2)

⑨ Find volume of $z = x^2 + y^2$ and below by $y = x$, $x = 0$, $x + y = 2$

⑩ Find Area bounded by ~~$y = 2x$~~ ~~$y = x$~~ $x = y^2$ and $x = 2y^2 - 2$.
(#8 on 15.3)