Find an equation for the **tangent plane** to $x^2 + 2xy - y^2 + z^2 = 7$ at the point $(1, -1, 3)$

Given $w = x^2 + y^2$, $x = r - s$, $y = r + s$, use the **Chain Rule** to express $\frac{\partial w}{\partial r}$ and $\frac{\partial w}{\partial s}$ as functions of r and s

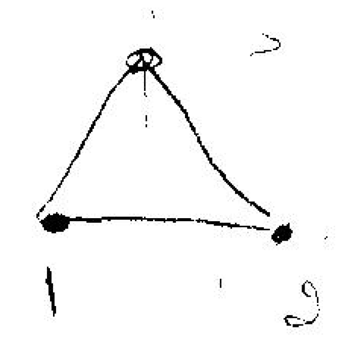
Use the method of **Lagrange Multipliers** to find the maximum and minimum values of $f(x, y, z) = x - 2y + 5z$ subject to the constraint $x^2 + y^2 + z^2 = 30$

Use the **Second Derivative Test** to find all local maxima, minima, and saddle points of the function $f(x, y) = x^4 + y^4 + 4xy$

Evaluate $\int_{-1}^{1}\int_{0}^{\sqrt{1-y^2}}\int_{0}^{x}(x^2 + y^2)\,dz\,dx\,dy$ $\left\{\text{answer} : \frac{2}{5}\right)$

Evaluate $\int_{0}^{1}\int_{2y}^{2} 4\cos x^2\,dx\,dy$ $\int_0^2\int_0^{x/2} 4\cos x^2\,dy\,dx = \sin 4$

Find the volume of the tetrahedron in the first octant bounded by the coordinate planes and the plane passing through (1,0,0), (0,2,0), and (0,0,3). Answer: 1 $\int_0^1\int_0^{2-2x}\int_0^{3-3x-\frac{3}{2}y} dz\,dy\,dx$



Find the interval of convergence for the series $\sum_{n=1}^{\infty}\frac{x^n}{\sqrt{n}}$ $-1 \le x < 1$

Use power series to evaluate $\lim_{x\to 0}\frac{7\sin x}{e^{2x} - 1} = \frac{7}{2}$ $\frac{x}{1} + \frac{y}{2} + \frac{z}{3} = 1$

Find the Taylor polynomial of degree 3 at $x = 0$ for $f(x) = e^{-x/2}$
$1 - \frac{x}{2} + \frac{x^2}{8} - \frac{x^3}{48}$ e^x $z = 3 - 3x - \frac{3y}{2}$

Evaluate $\int_{0}^{\infty} x e^{-x^2}\,dx$ $\lim_{b\to\infty}\left(\frac{-e^{-b^2}}{2} + \frac{1}{2}\right) = \frac{1}{2}$ $3y - 3xy - \frac{3y^2}{4}\Big]_0$

$x^3 - 3x^2 + 3x$

$6 - 6x - 6x + 6x^2 - \frac{3}{4}(4 + 4x^2 - 8$

$6 - 12x$ $- 3 - 3x^2 + 6x$

$\int (3x^2 - 6$