$f(x,y) = x^2 + xy + \frac{y^2}{2} + 2x$

$\frac{1}{x}$ $\int x$

$\nabla f(x,y) = \begin{bmatrix} 2x+y+2 \\ x+y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

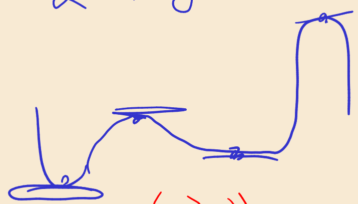
$x+y=0 \Rightarrow x=-y$

	xx	xy
	yx	yy

$2x+y=-2$ $\quad x=-2$

$-2y+y=-2 \Rightarrow y=2$

$(-2,2)$ [illegible]



$(-2,2)$

$\nabla^2 f(x,y) = \begin{bmatrix} \boxed{2} & 1 \\ 1 & 1 \end{bmatrix}$

$\det(H) = (2 \cdot 1) - 1^2 = 1 > 0 \Rightarrow$ [illegible]

$2 > 0$

$f''(x) > 0 \Rightarrow X$

$[>] \to + \to$ min

$\gtrless \to - \to$ max

$< \to$ [illegible]

$$f(x,y) = e^{2x+y} - x^2 - 2y$$

$$\nabla f(x,y) = \begin{bmatrix} 2e^{2x+y} - 2x \\ e^{2x+y} - 2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\left[\begin{array}{c|c} 4e^{2x+y} - 2 & 2e^{2x+y} \\ \hline 2e^{2x+y} & e^{2x+y} \end{array}\right]$$

$xy \quad yx$

solble $\Rightarrow$ $\boxed{x = 2}$

$$\begin{bmatrix} 4\cdot 2 - 2 & 2\cdot 2 \\ 2\cdot 2 & 2 \end{bmatrix} = \begin{bmatrix} 6 & 4 \\ 4 & 2 \end{bmatrix}$$

$12 - 16 = -4 < 0$

$6 > 0$

$$e^{4+y} = 2 \qquad \begin{bmatrix} 2 \\ \ln 4 - 4 \end{bmatrix}$$

$= \ln 2$

$4 + y = \ln 2$

$\boxed{y = \ln 2 - 4}$

$\log_a b = c \Rightarrow b = a^c$

$\ln e^x = x \qquad e^{4+y} = e^k$

$$\begin{bmatrix} 2 \\ \ln 2 - 4 \end{bmatrix}$$

$$3xy - x^2 - y^2$$

$$\nabla f = \begin{bmatrix} 3y - 2x \\ 3x - 2y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$2x \cdot t = 3x$

$t = 1.5$

$$\begin{bmatrix} \boxed{-2} & 3 \\ 3 & -2 \end{bmatrix}$$

$4 - 9 = -5 < 0$

-2 saddle

$\begin{cases} 3y = 2x \\ 3x = 2y \end{cases}$ $\begin{bmatrix} 0 \\ 0 \end{bmatrix}$

$4.5y = 3x$

$3x = 2y$

$4.5y = 2y$

$y = 0$

$x = 0$

$$\begin{vmatrix} f_{xx} & f_{xy} \\ f_{yx} & f_{yy} \end{vmatrix}$$

$$f_{xx} \cdot f_{yy} - f_{xy} f_{yx} > 0$$

$f_{xx} > 0$

$$\begin{matrix} -1 & 3 \\ -2 & -1 \end{matrix}$$

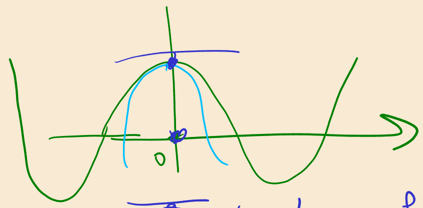
$1 - -2 \to +$

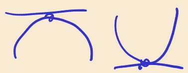
$-1 < 0$

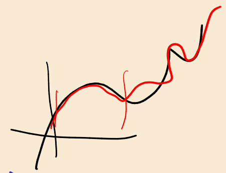
$D < 0 \to$ saddle

$f(x) \approx P(x)$

$\boxed{x^2 \ldots}$







$f(0) = P(0)$

$f'(0) = P'(0)$

$f''(0) = P''(0)$

$P(x) = f(0) + f'(0)x + \frac{f''(0)}{2!} \cdot x^2 + \ldots + \frac{f'''(0)}{3!} x^3$

$f(a) + f'(a)(x-a) + \frac{f''(a)}{2!}(x-a)^2 \ldots$

$e^x, \; a = 0$

$e^x \approx \underbrace{1 + x + \frac{1}{2!}x^2 + \frac{x^3}{3!} + R}$

$\sqrt{1+x} \qquad (1+x)^{\frac{1}{2}} = \boxed{\frac{1}{2}(1+x)^{-\frac{1}{2}}} = \frac{1}{2\sqrt{1+x}}$

$P(x) = 1 + \frac{1}{2}x - \frac{1}{8}x^2$

$\boxed{f'(a)(x-a)}$

$\left(\frac{1}{2}(1+x)^{-\frac{1}{2}}\right)' =$

$\boxed{\frac{1}{2!} \cdot -\frac{1}{4} x^2} =$

$\frac{1}{2}(1+x)^{-\frac{1}{2}}$

$\frac{1}{3!} \cdot \frac{1}{8} x^3$

$\frac{1}{2} \cdot -\frac{1}{2}(1+x)^{-\frac{3}{2}}$

$\frac{1}{1 \cdot 2 \cdot 3} \frac{3}{8} x^3$

$\frac{1}{2} \cdot -\frac{1}{2} \cdot -\frac{3}{2}(1+x)^{-\frac{5}{2}}$

$\frac{1}{16} x^3 \qquad 5 - \frac{5}{2} \qquad 4! \qquad 5 \qquad \frac{3}{8}(1+x)^{-\frac{5}{2}}$