

(1)

| i r a d 7 | a n N

$$\begin{aligned}
 1(c) \quad & \int \frac{X}{\sqrt{X+1} + 1} \cdot \frac{\sqrt{X+1} - 1}{\sqrt{X+1} - 1} dx \\
 &= \int \frac{X(\sqrt{X+1} - 1)}{X} dx = \int \sqrt{X+1} - 1 dx \\
 &= \int \sqrt{X+1} dx - \int 1 dx = \frac{2}{3} (X+1)^{3/2} - X + C
 \end{aligned}$$

$$\begin{aligned}
 1a \quad & \left. \begin{aligned} t &= e^{x/2} \\ t^2 &= e^x \\ 2t dt &= e^x dx = t^2 dx \\ dx &= \frac{2 dt}{t} \end{aligned} \right\} = 2 \int \frac{t}{(t^2 - t) t} dt
 \end{aligned}$$

$$= 2 \int \frac{1}{t(t-1)} dt \quad \frac{1}{t(t-1)} = \frac{A}{t} + \frac{B}{t-1}$$

$$A = -1, B = 1$$

$$\begin{aligned}
 2 \int \frac{1}{t-1} - \frac{1}{t} dt &= 2 (\ln|t-1| - \ln|t|) + C \\
 &= 2 \ln|e^{x/2} - 1| - 2 \ln|e^{x/2}| + C \\
 &= 2 \ln|e^{x/2} - 1| - X + C
 \end{aligned}$$

$$\begin{aligned}
 2) (1) f'_x &= 3x^2y - 3y = 0 \rightarrow 3y(x^2 - 1) = 0 \\
 & \quad y = 0, x = \pm 1 \\
 (2) f'_y &= x^3 - 3x + 2y = 0
 \end{aligned}$$

(2)

$$\frac{y=0}{3}$$

$$(2) \quad X - 3X = 0$$

$$X(X^2 - 3) = 0$$

$$X = 0, \pm\sqrt{3}$$

$$(0, 0), (\sqrt{3}, 0)$$

$$(-\sqrt{3}, 0)$$

$$\frac{X=1}{(2) \quad -2+2y=0}$$

$$y=1$$

$$(1, 1)$$

$$\frac{X=-1}{(2) \quad -1+3+2y=0}$$

$$y=-1$$

$$(-1, -1)$$

	(1, 1)	(-1, -1)	(0, 0)	($\sqrt{3}, 0$)	($-\sqrt{3}, 0$)
$A = f''_{xx} = 6xy$	6	6	0	0	0
$B = f''_{xy} = 3x^2 - 3$	0	0	-3	6	6
$C = f''_{yy} = 2$	2	2	2	2	2
$D = AC - B^2$	+	+	-	-	-
	min	min	f_{max}	f_{max}	f_{max}

$$\begin{aligned} 3) \quad f'_x &= 1+y=0 \rightarrow y=-1 \\ f'_y &= x+1=0 \rightarrow x=-1 \end{aligned} \quad \left| \quad (-1, -1) \right.$$

$$\delta(1) \delta(2) \delta(1) \delta(2)$$

$$L(x, y, \lambda) = x + xy + y - \lambda(x^2 + y^2 - 1)$$

$$(1) \quad L'_x = 1+y - \lambda(2x) = 0$$

$$(2) \quad L'_y = x+1 - \lambda(2y) = 0$$

$$(3) \quad x^2 + y^2 - 1 = 0$$

$$\lambda = \frac{1+y}{2x} = \frac{1+x}{2y}$$

$$(x, y \neq 0) \rightarrow$$

$$\frac{1+y}{2x} = \frac{1+x}{2y}$$

$$2y + 2y^2 = 2x + 2x^2 \rightarrow x^2 - y^2 = y - x$$

(3)

$$(x+y)(x-y) = y-x \rightarrow (x+y)(x-y) = -(x-y)$$

$$x+y = -1 \rightarrow y = -1-x$$

$$(y \neq x) \rightarrow$$

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$$\underline{y = -1-x}$$

$$(3) \quad x^2 + x^2 + 2x + 1 - 1 = 0$$

$$2x^2 + 2x = 0$$

$$2x(x+1) = 0$$

$$\text{၈၁၀၃၃} \hookrightarrow x=0, \quad x=-1$$

$$y=0 \rightarrow \text{၈၁၀၃၃}$$

$$\underline{x=0}$$

$$\underline{y=0}$$

$$(1) \quad 1+y=0 \rightarrow y=-1$$

$$(2) \quad x+1=0 \rightarrow x=-1$$

$$(2) \quad 1+2x=0$$

$$(1) \quad 1-2x=0$$

$$(3) \quad 0+1-1=0 \checkmark$$

$$(3) \quad 1+0-1=0 \checkmark$$

$$(0, -1)$$

$$(-1, 0)$$

$$\underline{y=x}$$

$$(3) \quad x^2 + x^2 - 1 = 0$$

$$2x^2 = 1$$

$$x = \pm \frac{1}{\sqrt{2}}$$

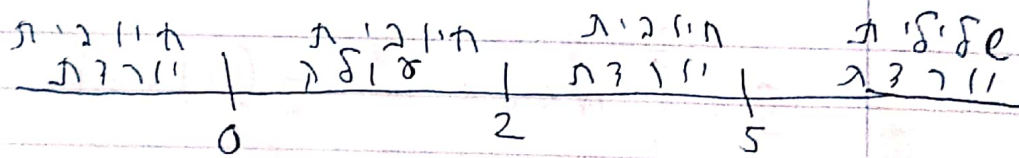
$$\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right), \left(-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}} \right)$$

(4)

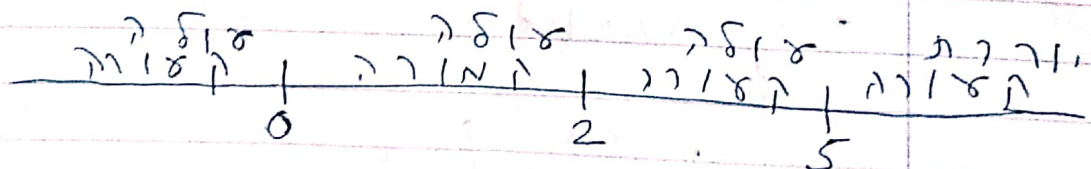
(x, y)	$f(x, y) = x + xy + y$
$(1, 0)$	1
$(-1, 0)$	-1 min
$(0, 1)$	1
$(0, -1)$	-1 min
$(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$	$\frac{1+2\sqrt{2}}{2}$ max
$(-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}})$	$\frac{1-2\sqrt{2}}{2}$

4

$f'(x)$



$f(x)$



$$\frac{x > 2}{x > 2}$$

$$\frac{x < 2}{x < 2}$$

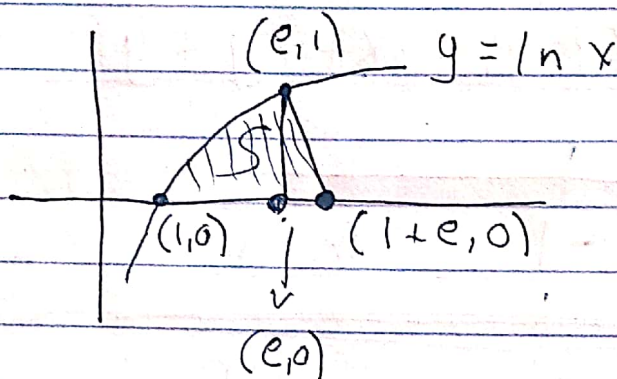
$$\frac{x > 5}{x > 5}$$

$$\frac{x < 5}{x < 5}$$

$$\frac{\text{max}}{x = 5}$$

$$\frac{\text{min}}{x = 0, 2}$$

5



$f'(x) = \frac{1}{x}$, $f'(1) = 1$ $m = -1$

$$y - 1 = -(x - e) \rightarrow \boxed{y = -x + 1 + e}$$

$$-x + 1 + e = 0 \rightarrow \boxed{x = 1 + e}$$

$$S = \int_1^e \ln x \, dx + \frac{1}{2}(1)(1)$$

$$= \int_1^e \ln x \cdot 1 \, dx + \frac{1}{2}$$

$$f = \ln x \quad g' = 1$$

$$f' = \frac{1}{x} \quad g = x$$

$$= x \ln x - \int_1^e 1 \, dx + \frac{1}{2}$$

$$= x \ln x - x \Big|_1^e + \frac{1}{2}$$

$$= e - e - (-1) + \frac{1}{2} = 1 + \frac{1}{2} = \boxed{\frac{3}{2}}$$

⑥

$$30 \text{ 88N } p'8''CN \text{ 720N} = X$$

$$0 \leq X \leq 30$$

$$R(X) = (150 - 3X)(30 + X) - 30(30 + X)$$

$$= (30 + X)(150 - 3X - 30) = (30 + X)(120 - 3X)$$

$$R(X) = -3X^2 + 30X + 3600$$

$$R'(X) = -6X + 30 = 0 \rightarrow X = 5$$

X	$R(X) = -3X^2 + 30X + 3600$
0	3600
5	3675
30	1800

7''1e 777

$$p'8''CN \text{ 720N} = X$$

$$30 \leq X \leq 60$$

$$R(X) = (150 - 3(X - 30))X - 30X$$

$$R(X) = 150X - 3X^2 + 90X - 30X$$

$$R(X) = -3X^2 + 210X$$

$$R'(X) = -6X + 210 = 0$$

$$X = 35$$

max

X	$R(X) = -3X^2 + 210X$
30	3600
35	3675
60	1800