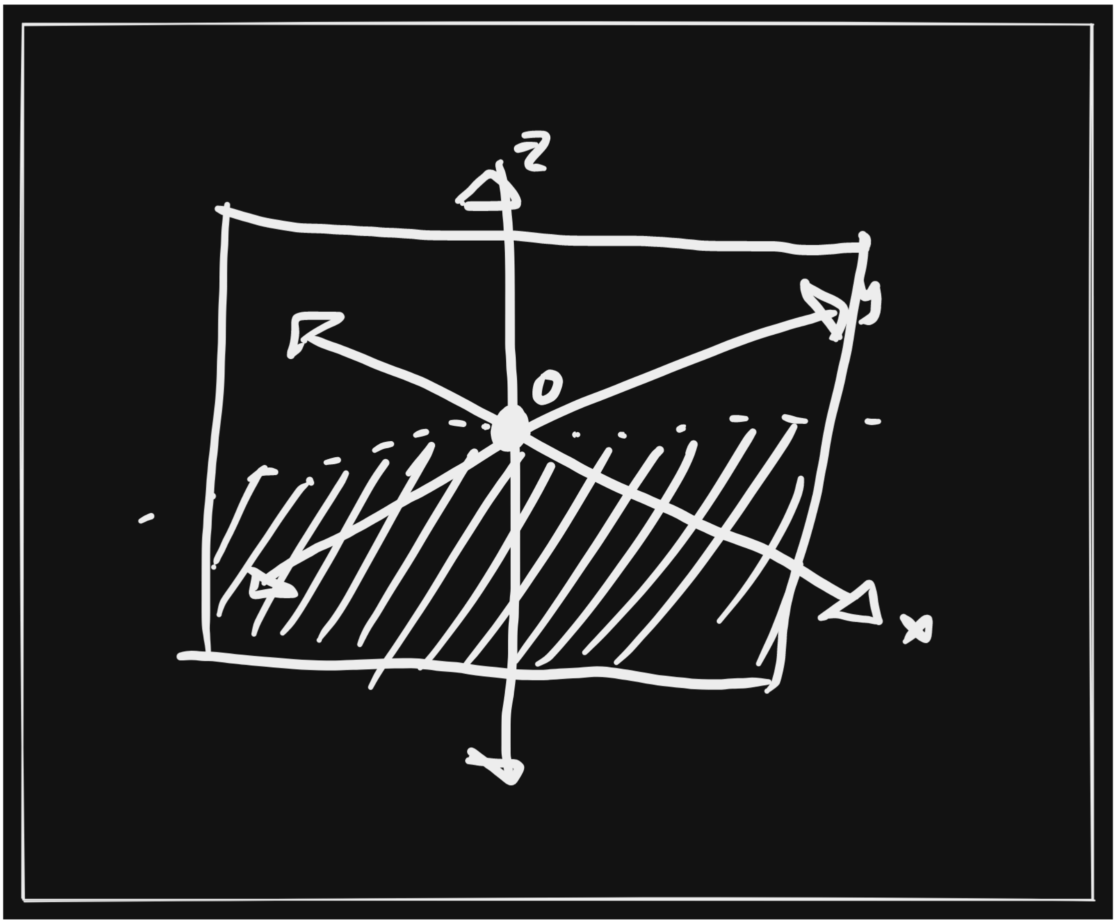
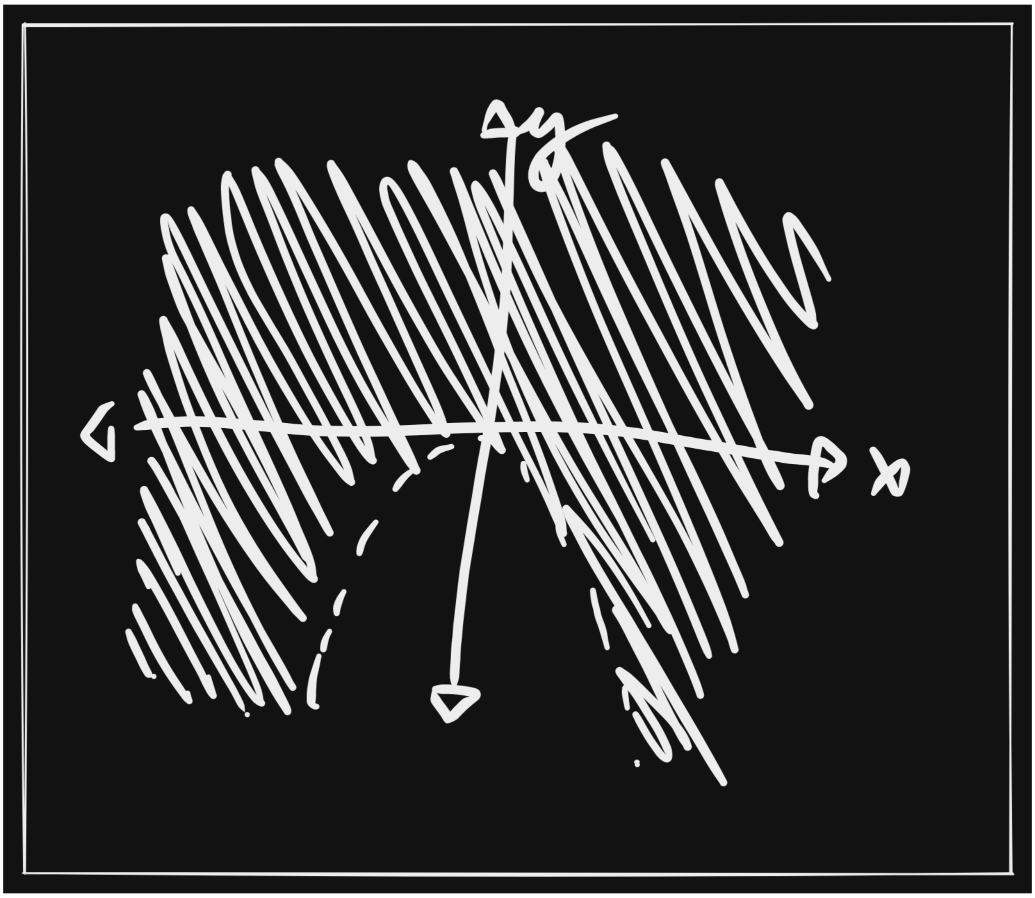
14.1

7



9



19

i: B

ii: A

21

a: D

b: C

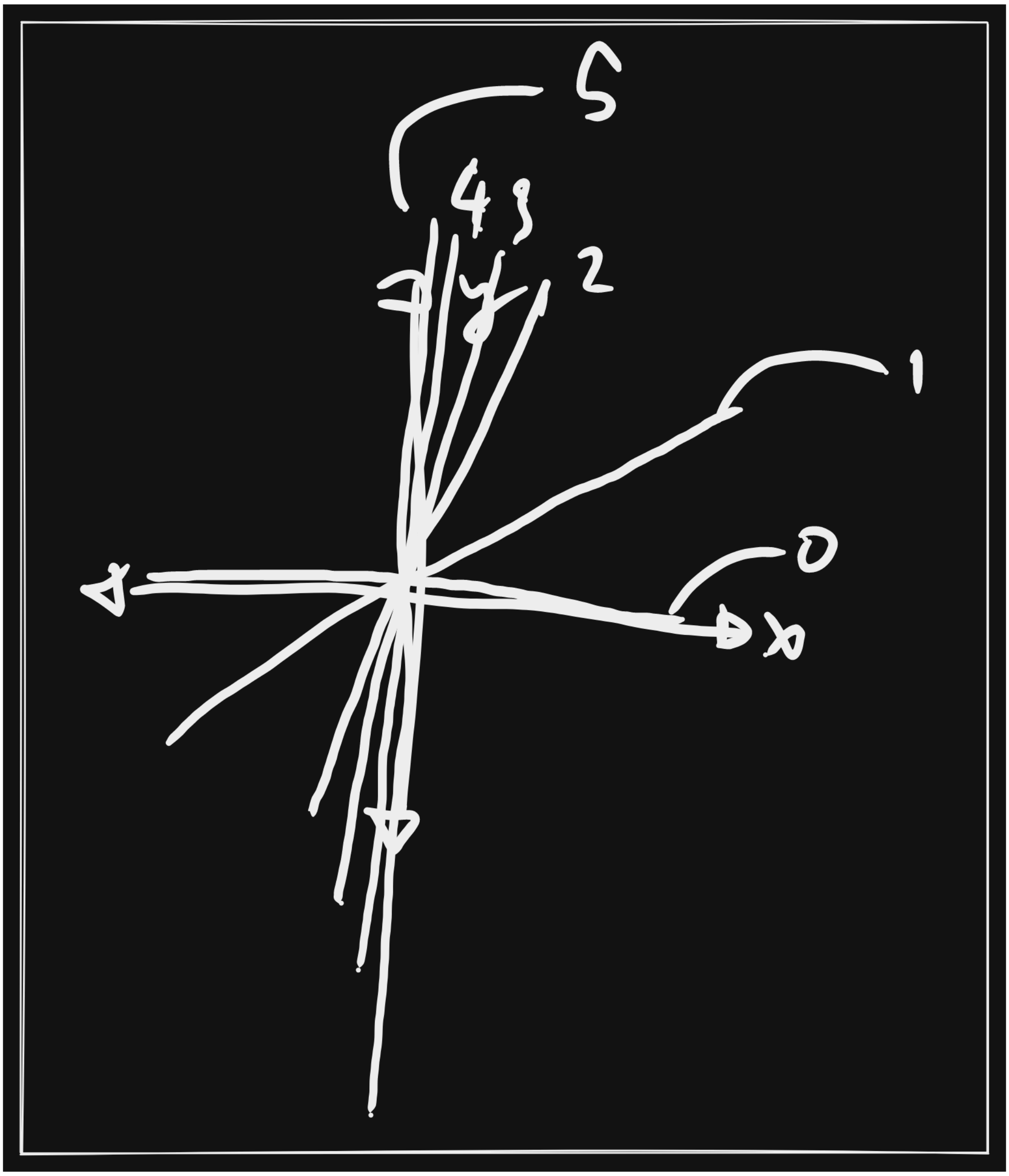
c: E

d: B

e: A

f: F

33



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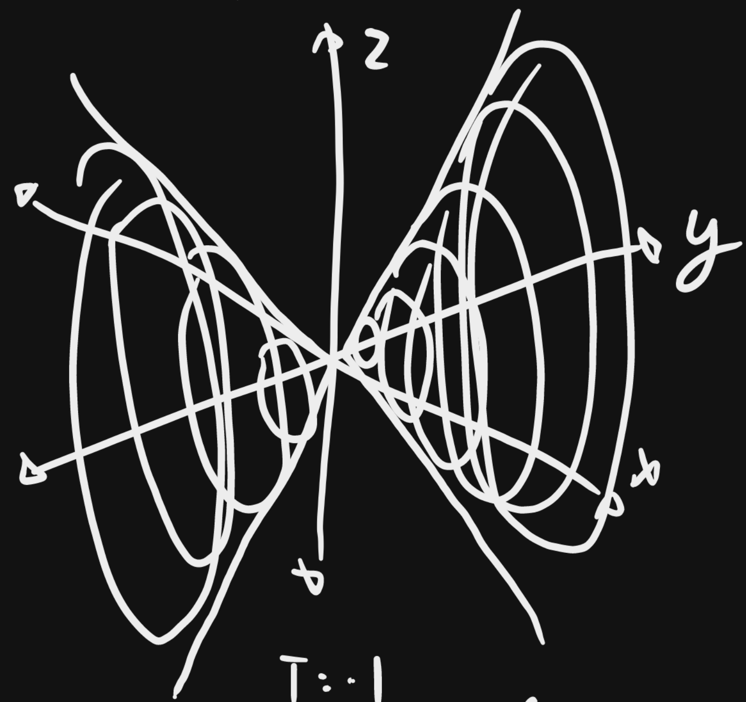
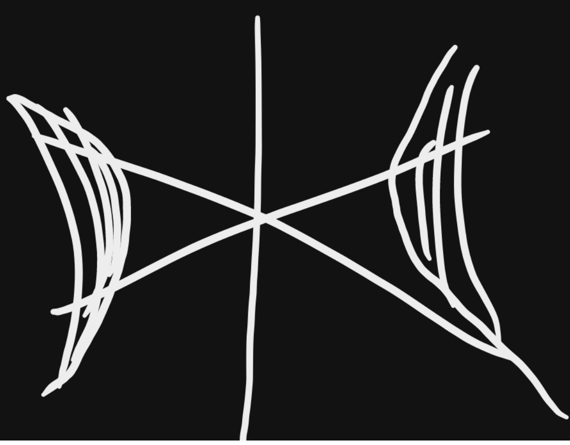
T=0



T=-1

T=-2



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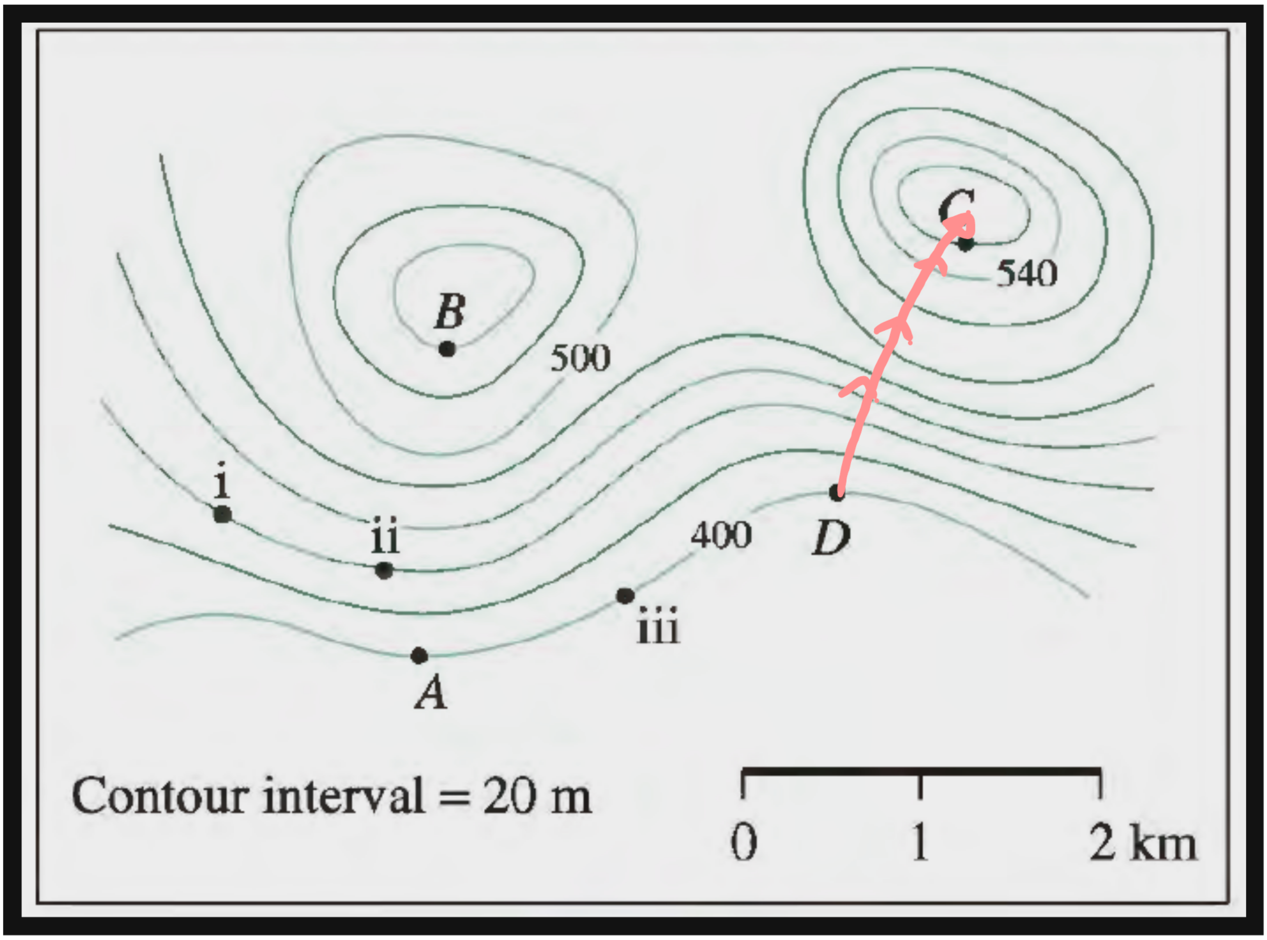

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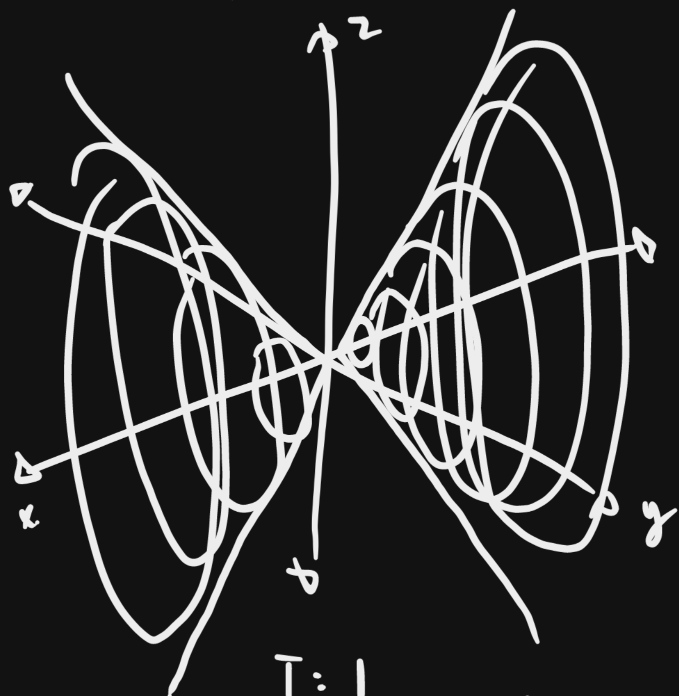
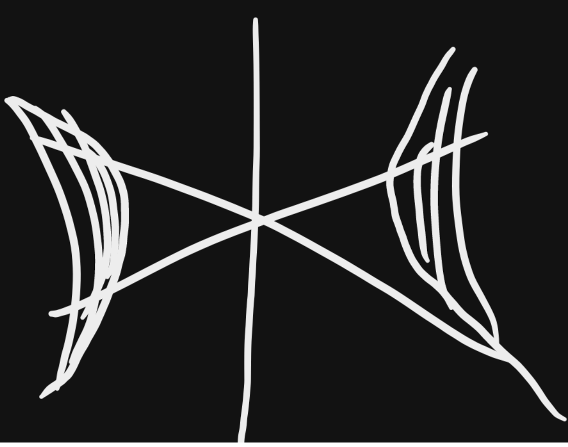
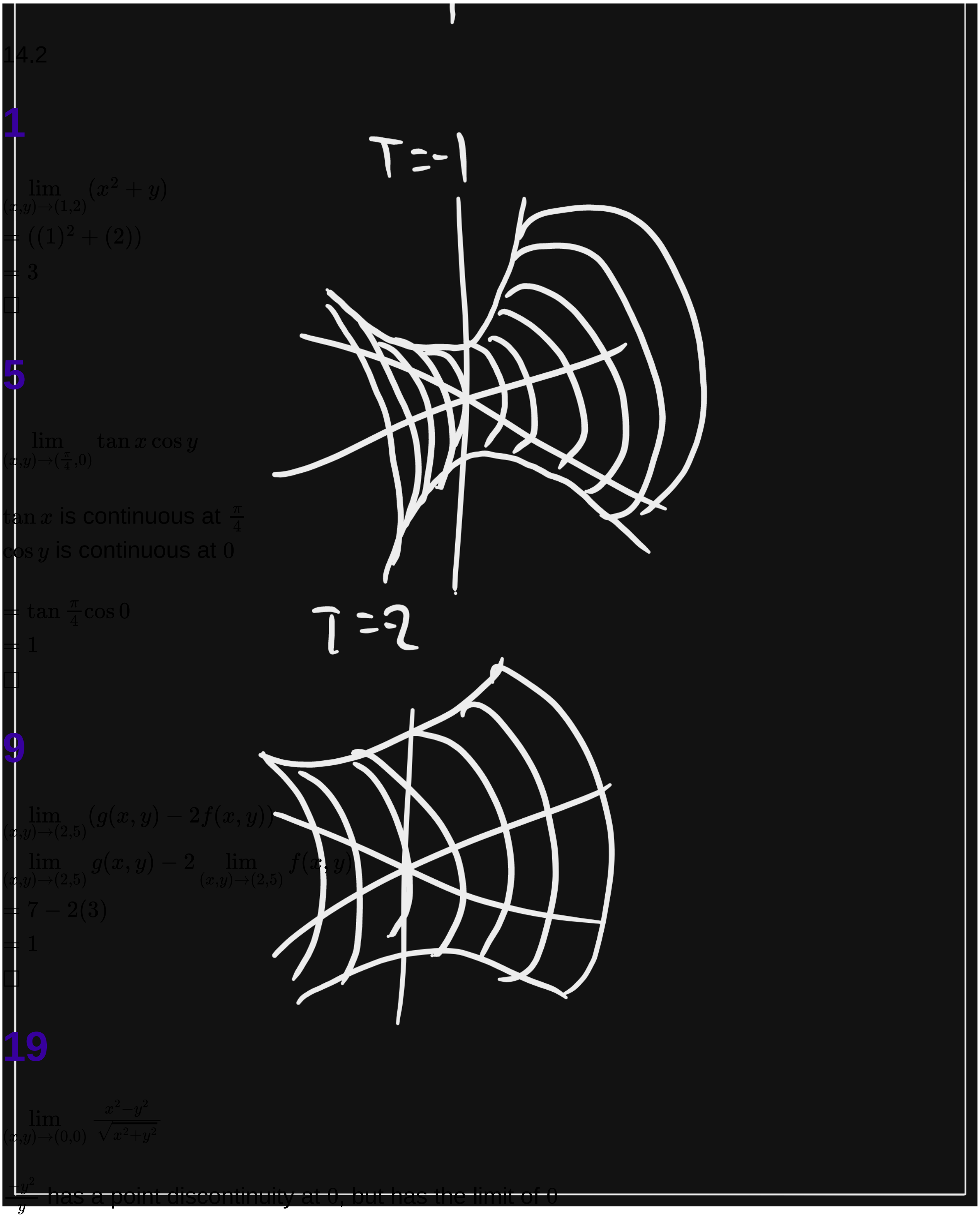
T = 0



T : 1

T = 2





14.2

1

$$\lim_{(x,y)\to(1,2)} (x^2+y)$$

$=((1)^2+(2))$

$=3$

□

5

$$\lim_{(x,y)\to(\frac{\pi}{4},0)} \tan x \cos y$$

$\tan x$ is continuous at $\frac{\pi}{4}$

$\cos y$ is continuous at 0

$=\tan\frac{\pi}{4}\cos 0$

$=1$

□

9

$$\lim_{(x,y)\to(2,5)} (g(x,y)-2f(x,y))$$

$=\lim_{(x,y)\to(2,5)} g(x,y) - 2\lim_{(x,y)\to(2,5)} f(x,y)$

$=7-2(3)$

$=1$

□

19

$$\lim_{(x,y)\to(0,0)} \frac{x^2-y^2}{\sqrt{x^2+y^2}}$$

$\frac{y^2}{y}$ has a point discontinuity at 0, but has the limit of 0

$\frac{x^2}{x}$ has a point discontinuity at 0, but also has the limit of 0

$=0$

□

23

$$\lim_{(x,y,z)\to(0,0,0)} \frac{x+y+z}{x^2+y^2+z^2}$$

$\frac{z}{z^2}$ is not continuous at 0, and the limit does not exist, with the positive limit approaching ∞ and the negative limit approaching $-\infty$

$\frac{y}{y^2}$ is not continuous at 0, and the limit also does not exist and has the same one-sided limits as z
$\frac{x}{x^2}$ has the same properties as y and z

Limit from	Value
$+z$	∞
$-z$	$-\infty$
$+y$	∞
$-y$	$-\infty$
$+x$	∞
$-x$	$-\infty$

Three of these six directional limits do not equal the other three limits, therefore the limit does not exist
□

31

$$\lim_{(x,y)\to(3,4)} \frac{1}{\sqrt{x^2+y^2}}$$

$\frac{1}{\sqrt{x^2+16}}$ is continuous at 3, with the value of $1/5$
$\frac{1}{\sqrt{9+y^2}}$ is continuous at 4, with the value of $1/5$

$= 1/5$
□

41

$$\lim_{(x,y)\to(0,0)} \frac{x^2+y^2}{\sqrt{x^2+y^2+1}-1}$$

$\frac{y^2}{\sqrt{y^2+1}-1}$ has a point discontinuity at 0, but
$\lim_{y\to 0} \frac{2y}{y(y^2+1)^{-1/2}}$
$= \lim_{y\to 0} \frac{2}{(y^2+1)^{-1/2}}$
$= 2$

And the same is true for x, meaning the original limit is also 2

$= 2$
□

14.3

13

NW

19

$z = \frac{x}{y}$
$\frac{\partial}{\partial x} = \frac{1}{y}$
$\frac{\partial}{\partial y} = \frac{-x}{y^2}$
$\square$

25

$z = \cos\frac{1-x}{y}$
$\frac{\partial}{\partial x} = \frac{1}{y}\sin\frac{1-x}{y}$
$\frac{\partial}{\partial y} = \frac{x-1}{y^2}\sin\frac{1-x}{y}$
$\square$

33

$z = e^{-x^2-y^2}$
$\frac{\partial}{\partial x} = -2xe^{-x^2-y^2}$
$\frac{\partial}{\partial y} = -2ye^{-x^2-y^2}$
$\square$

41

$Q = \frac{L}{M}e^{-Lt/M}$
$\frac{\partial}{\partial L} = (\frac{-Lt}{M^2} + \frac{1}{M})e^{-Lt/M}$
$\frac{\partial}{\partial M} = (\frac{-L}{M^2} + \frac{L^2t}{M^3})e^{-Lt/M}$
$= \frac{L(Lt-M)}{M^3}e^{-Lt/M}$
$\frac{\partial}{\partial M} = \frac{-L^2}{M^2}e^{-Lt/M}$
$\square$

57

$f(x, y) = x\ln(y^2)$
$\frac{\partial}{\partial y} = \frac{2x}{y}$
$\frac{\partial^2}{\partial^2 y} = \frac{-2x}{y^2}$
$\frac{\partial^2}{\partial^2 y}(2, 3) = \frac{-4}{9}$
$\square$

61

$f(u, v) = \cos(u + v^2)$
$\frac{\partial}{\partial u} = -\sin(u + v^2)$
$\frac{\partial^2}{\partial^2 u} = -\cos(u + v^2)$

$\frac{\partial^3}{\partial^2 u \partial v} = 2v \sin(u + v^2)$

$\square$