18. (a) Domain: $\{(x,y) \mid y-x \geq 0\}$

(b) Range: $z \geq 0$

(c) Level curves are straight lines $y-x=C$ with $C \geq 0$.

(d) boundary is $\sqrt{y-x}=0 \Rightarrow y=x$, a straight line.

(e) closed region.

(f) unbounded area.

22. (a) Domain: $\{(x,y) \mid x \neq 0\}$

(b) Range: all of $\mathbb{R}$.

(c) Level curves: if $f(x,y)=0$, which is $\frac{y}{x^2}=0 \Rightarrow y=0$, so level curve is x-axis without (0,0)

otherwise $f(x,y)=C \neq 0$, $y=Cx^2$ is a parabola without (0,0)

(d) boundary: line $x=0$

(e) open region

(f) unbounded area.

30 (a) Domain: $\{(x,y) \mid 0 \leq x^2+y^2 < 9\}$

(b) Range: $z < \ln 9$

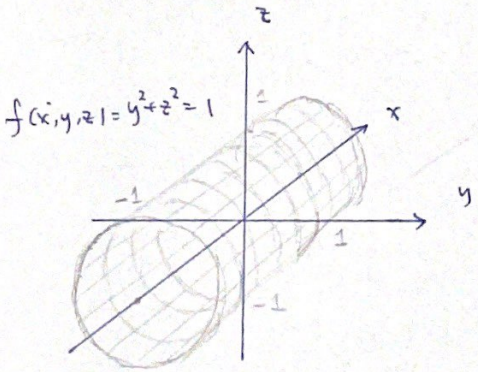
(c) Level curves: circles with radius < 3 and which centered at origin.

(d) boundary: circle $x^2+y^2=9$

(e) open region

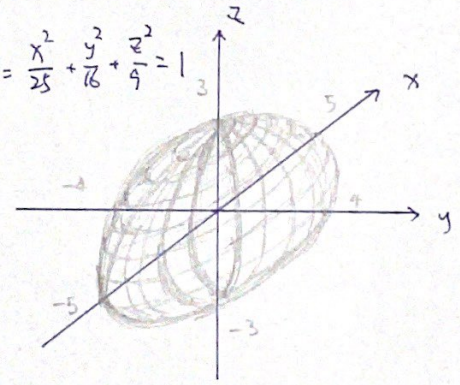
(f) bounded area.

58.



$f(x,y,z)=y^2+z^2=1$

60.



$f(x,y,z)=\frac{x^2}{25}+\frac{y^2}{16}+\frac{z^2}{9}=1$

38. a. All (x,y,z) with out $(x,0,0)$

b. All (x,y,z) with out $(x,0,0)$ and $(0,y,0)$

52. $w_x = \frac{\partial w}{\partial x} = e^x + \ln y + \frac{y}{x}$ $\quad w_{xy} = \frac{\partial^2 w}{dy\,dx} = \frac{1}{y} + \frac{1}{x}$

$w_y = \frac{\partial w}{\partial y} = \frac{x}{y} + \ln x$ $\quad w_{yx} = \frac{\partial^2 w}{dx\,dy} = \frac{1}{y} + \frac{1}{x}$, so $w_{xy} = w_{yx}$

54. $w_x = \sin y + y\cos x + y$ $\quad w_{xy} = \frac{\partial^2 w}{dy\,dx} = \cos y + \cos x + 1$

$w_y = x\cos y + \sin x + x$ $\quad w_{yx} = \frac{\partial^2 w}{dx\,dy} = \cos y + \cos x + 1$, so $w_{xy} = w_{yx}$