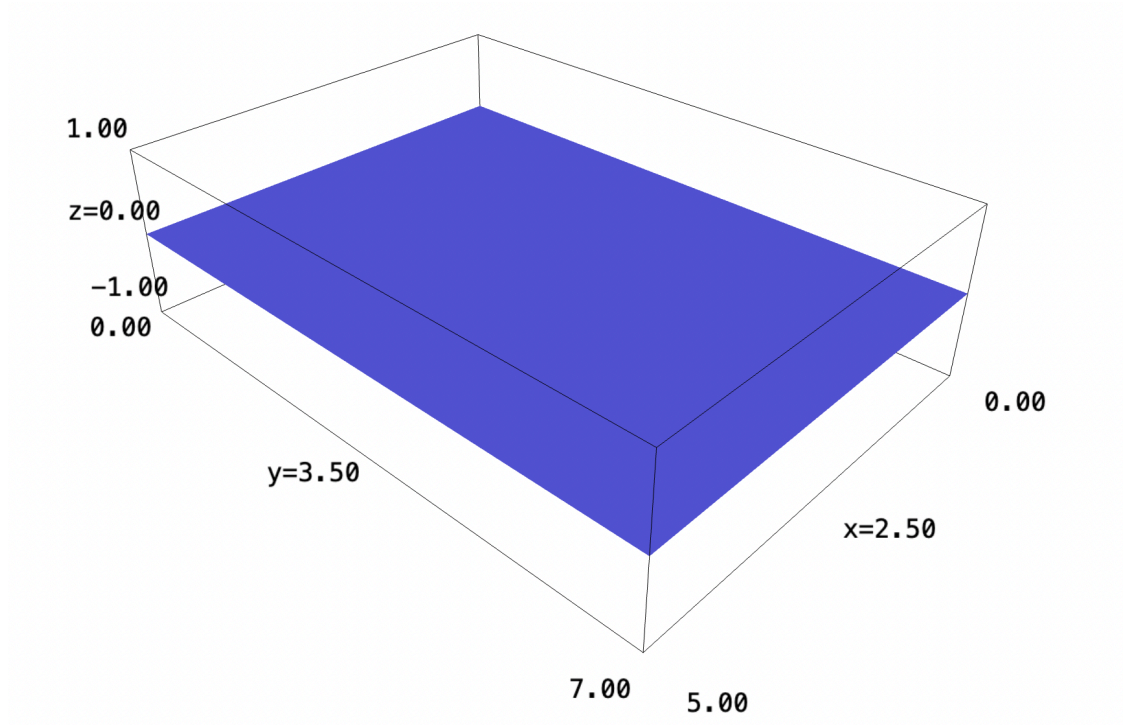


1 | Rectangle

```
f(x) = 0
plot3d(f, (x,0,5), (y,0,7))
```



$$dA = \sqrt{1} = 1 \quad (1)$$

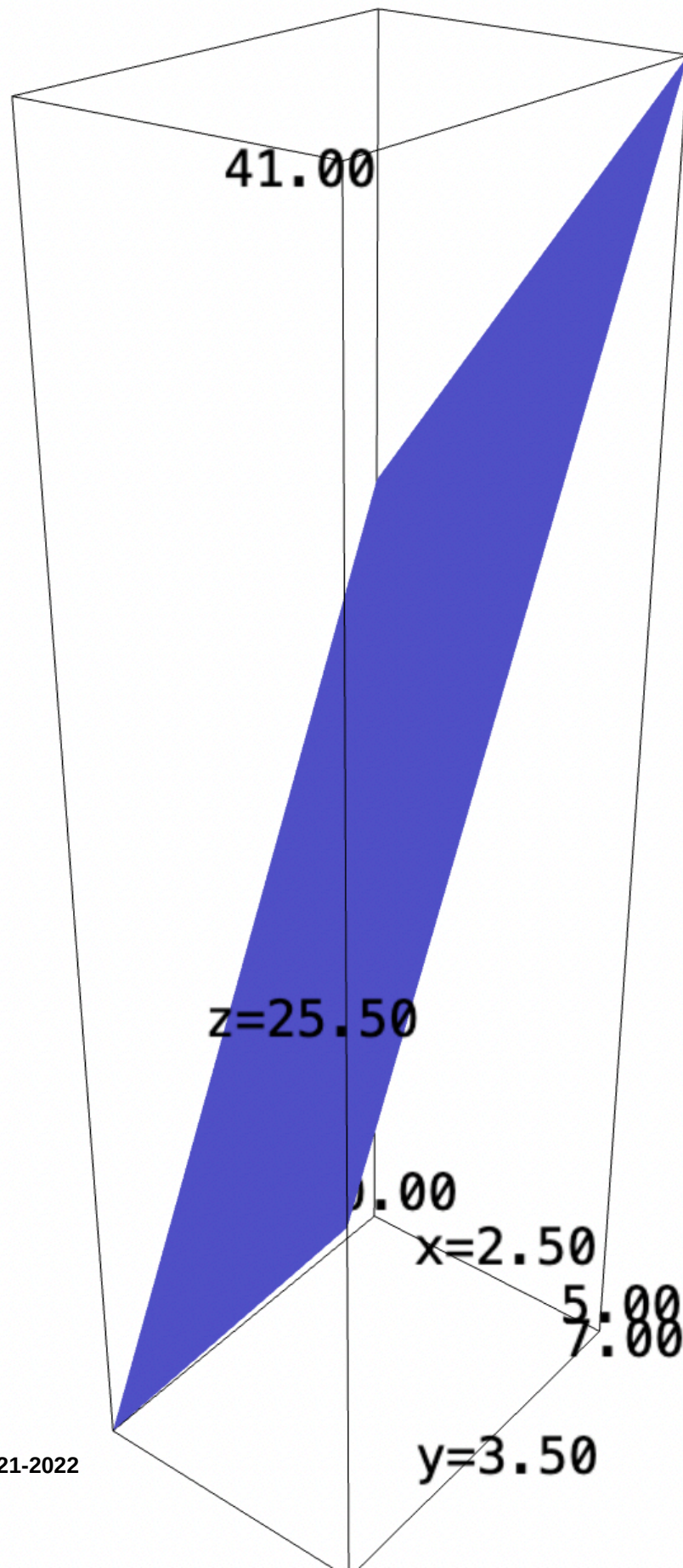
$$\iint_V 1 dV \quad (2)$$

$$\Rightarrow \int_0^5 \int_0^7 1 dy dx \quad (3)$$

$$\Rightarrow 35 \quad (4)$$

2 | Area of a Plane

```
f(x,y) = 2*x+3*y+10
plot3d(f, (x,0,5), (y,0,7))
```



$$dA = \sqrt{1 + \left(\frac{\partial f}{\partial x}\right)^2 + \left(\frac{\partial f}{\partial y}\right)^2} dV \quad (5)$$

$$= \sqrt{1 + 2^2 + 3^2} dV \quad (6)$$

$$= \sqrt{1 + 4 + 9} dV \quad (7)$$

$$= \sqrt{14} dV \quad (8)$$

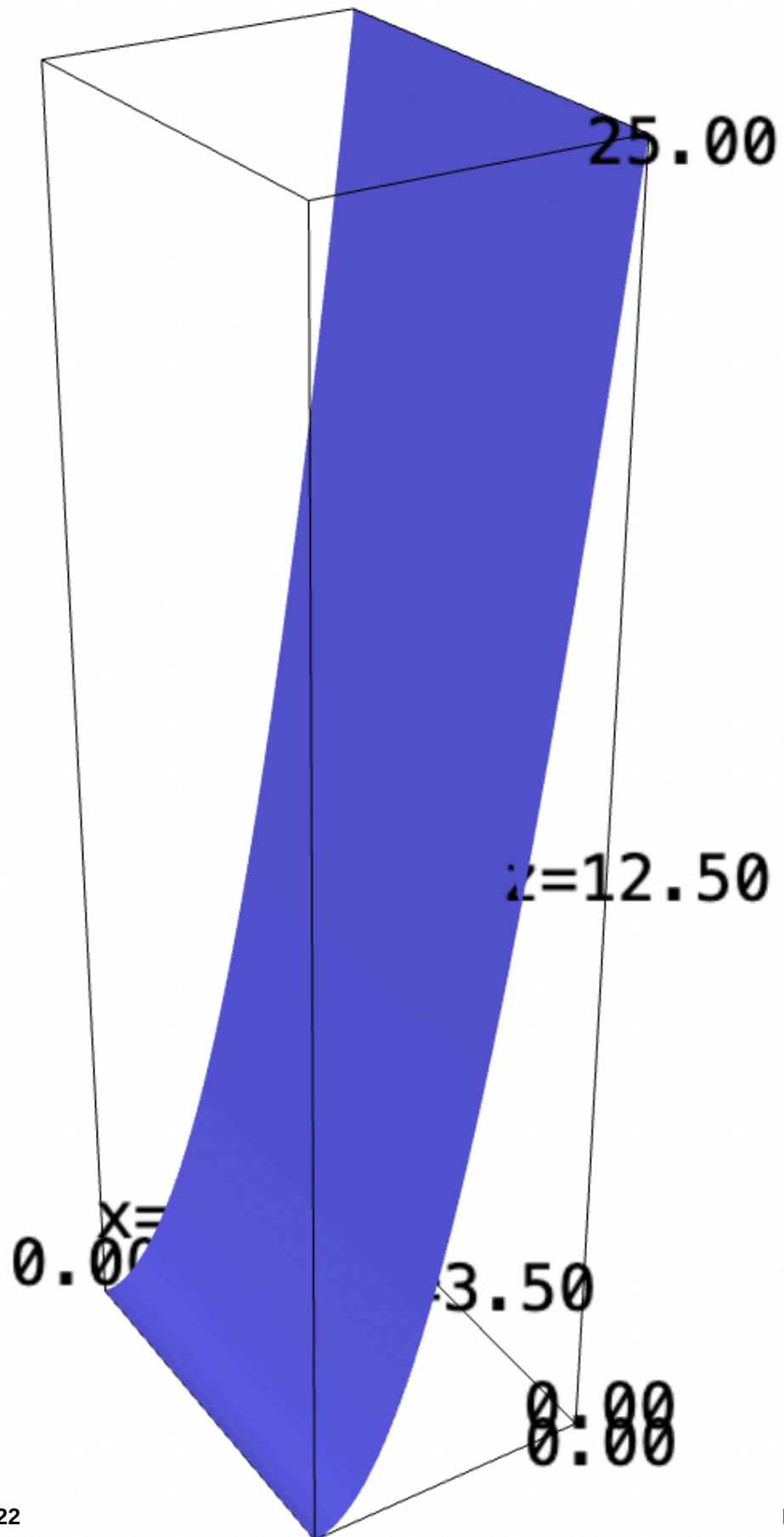
$$\iint_V \sqrt{14} dV \quad (9)$$

$$\Rightarrow \int_0^5 \int_0^7 \sqrt{14} dy \, dx \quad (10)$$

$$\Rightarrow 35\sqrt{14} \quad (11)$$

3 | Parabola

```
f(x,y) = x^2
plot3d(f, (x,0,5), (y,0,7))
```



$$dA = \sqrt{1 + \left(\frac{\partial f}{\partial x}\right)^2 + \left(\frac{\partial f}{\partial y}\right)^2} dV \quad (12)$$

$$= \sqrt{1 + (2x)^2} dV \quad (13)$$

$$= \sqrt{1 + 4x^2} dV \quad (14)$$

$$\iint_V \sqrt{1 + 4x^2} dV \quad (15)$$

$$\Rightarrow \int_0^5 \int_0^7 \sqrt{1 + 4x^2} dy dx \quad (16)$$

$$\Rightarrow \frac{35}{2} \sqrt{101} + \frac{7}{4} \operatorname{arcsinh}(10) \quad (17)$$

```
f(x,y) = sqrt(1+4*x^2)
f.integrate(y, 0,7).integrate(x, 0,5)
```