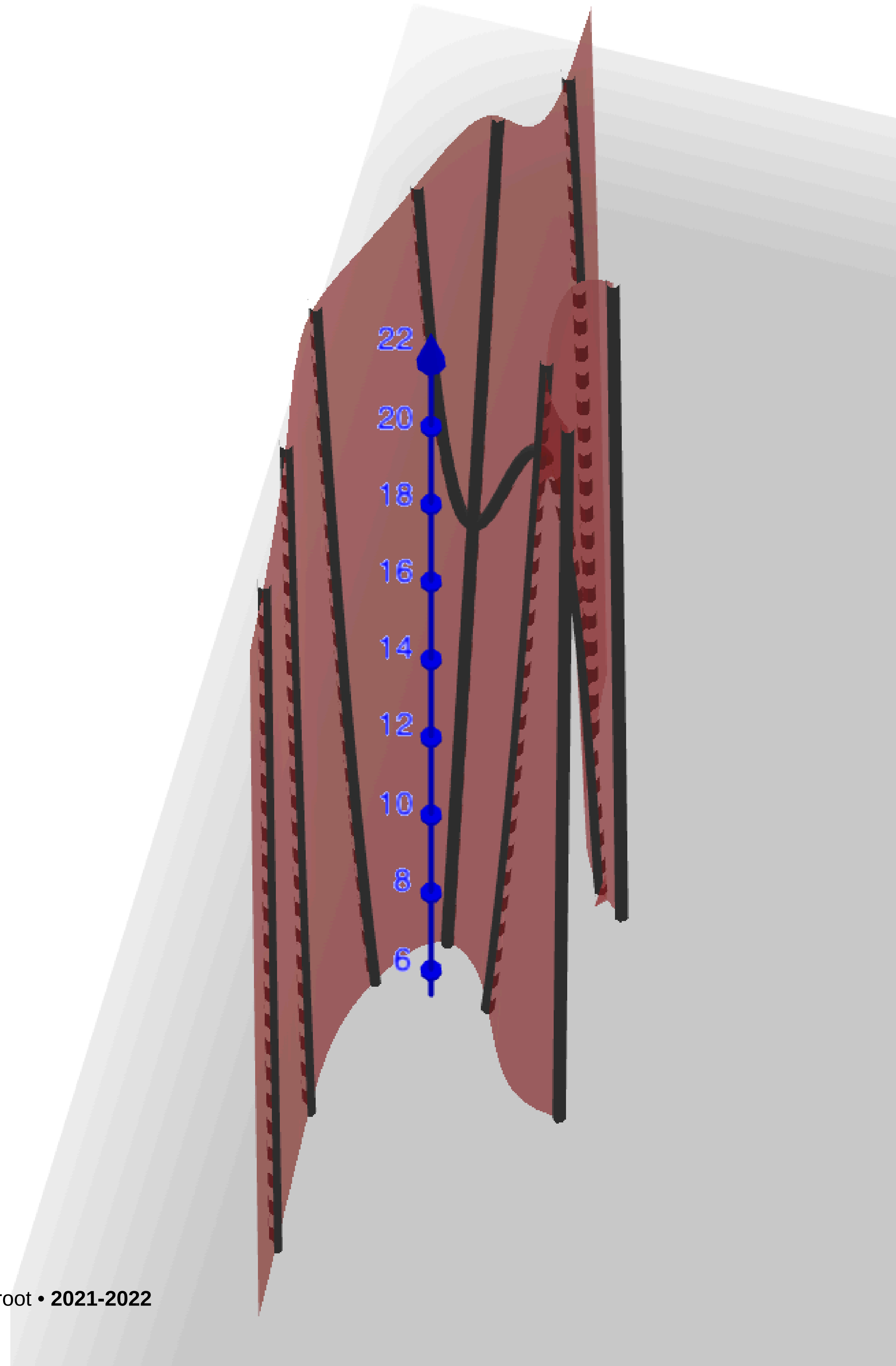
15 | $f(x, y) = 7x + 2x^2y^3 + 10y^2$



15.1 | $\frac{\partial}{\partial x}$

$$7 + 4xy^3$$

15.2 | $\frac{\partial}{\partial y}$

$$6x^2y^2 + 20y$$

15.3 | $\frac{\partial^2}{\partial^2 x}$

$$4y^3$$

15.4 | $\frac{\partial^2}{\partial^2 y}$

$$12x^2y + 20$$

15.5 | $\frac{\partial^2}{\partial x \partial y}$

$$12xy^2$$

15.6 | $\frac{\partial^3}{\partial^3 x}$

$$0$$

15.7 | $\frac{\partial^3}{\partial^3 y}$

$$12x^2$$

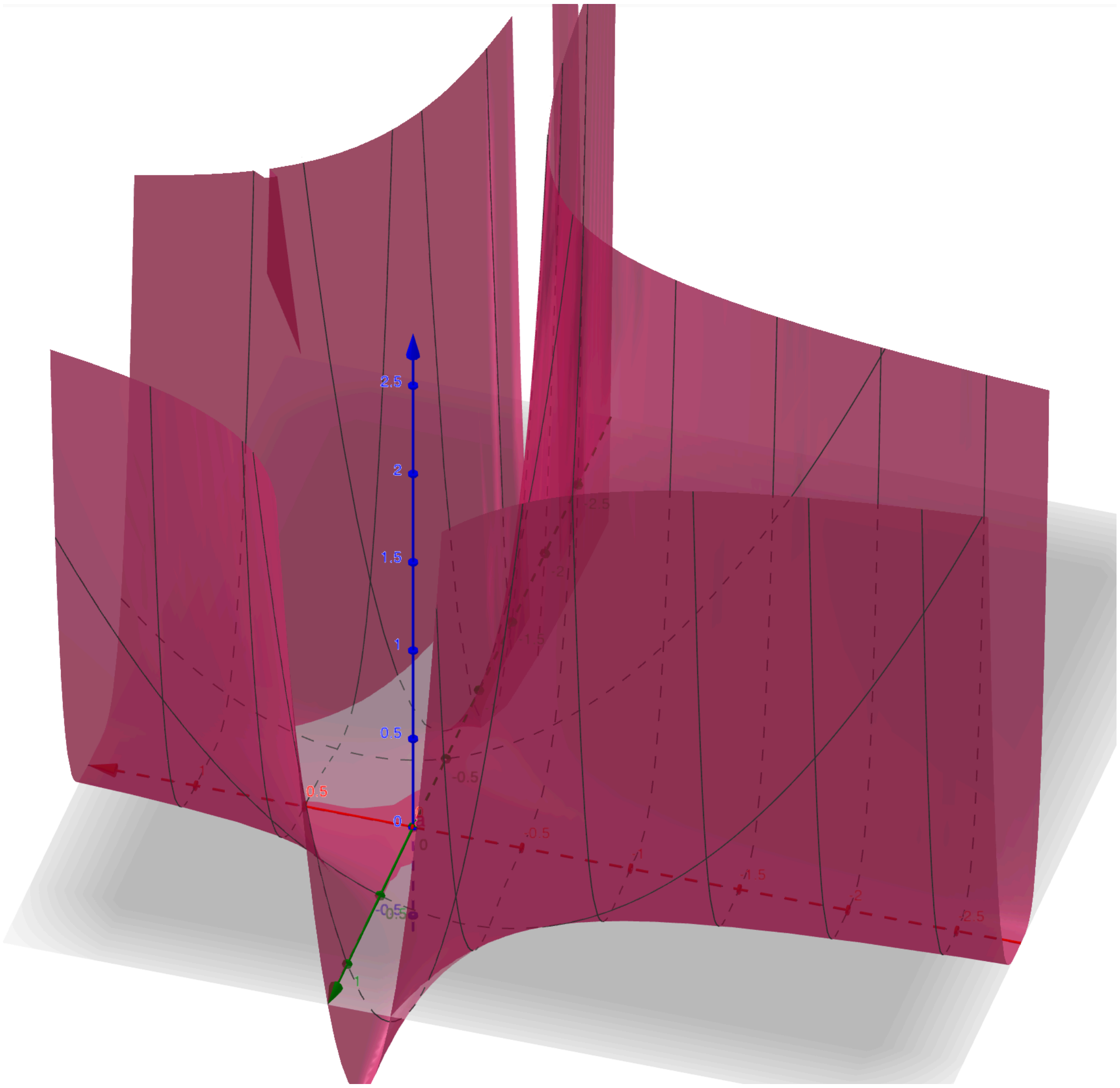
15.8 | $\frac{\partial^3}{\partial^2 x \partial y}$

$$12y^2$$

15.9 | $\frac{\partial^3}{\partial^2 y \partial x}$

$$24xy$$

16 | $f(x, y) = 3xy^3 + 8x^2y^4$



16.1 | $\frac{\partial}{\partial x}$

$$3y^3 + 16xy^4$$

16.2 | $\frac{\partial}{\partial y}$

$$9xy^2 + 32x^2y^3$$

16.3 | $\frac{\partial^2}{\partial^2 x}$

$$16y^4$$

16.4 | $\frac{\partial^2}{\partial^2 y}$

$$18xy + 96x^2y^2$$

16.5 | $\frac{\partial^2}{\partial x \partial y}$

$$9y^2 + 64xy^3$$

16.6 | $\frac{\partial^3}{\partial^3 x}$

$$0$$

16.7 | $\frac{\partial^3}{\partial^3 y}$

$$18x + 192x^2y$$

16.8 | $\frac{\partial^3}{\partial^2 x \partial y}$

$$64y^3$$

16.9 | $\frac{\partial^3}{\partial^2 y \partial x}$

$$18y + 192xy^2$$

18 | **checking partial derivatives**

Is the following possible?

$$\frac{\partial}{\partial x} f = 2x + 3y$$
$$\frac{\partial}{\partial y} f = 4x + 6y$$

No, because if you integrate them, you have completely different functions.

$$\int (2x+3y)dx = x^2 + 3xy + C$$
$$\neq \int (4x+6y)dy = 3y^2 + 4xy + C$$

Upon checking my work with Ian, I realize that doing the mixed partial is probably cleaner because then there's no ambiguous $+C$ term.