

Ulll legy

2/8/24

Week 4 Review

1) a) domaine : $\frac{1}{x}$
 \sqrt{x}
 $\ln(x)$

$$y \neq 0 \quad x \in \mathbb{R}$$
$$\text{domain } \{(x, y) \in \mathbb{R}^3 \mid y \neq 0\}$$

b) $g(x, y) = c = \frac{x^2 + 2y}{y}$

$$cy = x^2 + 2y \quad (y \neq 0)$$

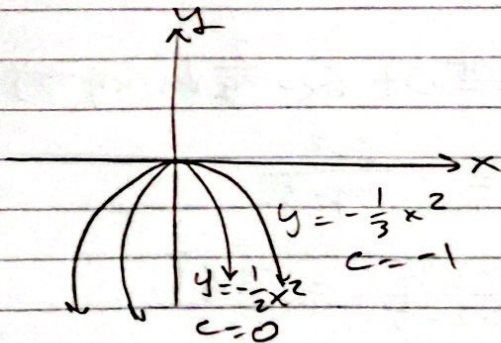
$$(c-2)y = x^2$$

if $c = 0 \quad (\neq 2)$

$$y = \frac{1}{c-2} x^2$$

$$y = \frac{1}{0-2} x^2 = -\frac{1}{2} x^2$$

if $c \neq 2$



2) a)

linear approx:

tangent plane: $z - z_0 = f_x(x_0, y_0)(x - x_0) + f_y(x_0, y_0)(y - y_0)$

\Downarrow
 (x_0, y_0, z_0)

$$z = f(x, y) \approx z_0 + f_x(x_0, y_0)$$

a) ① $x_0 = 3$ $y_0 = 2$

$$z_0 = f(x_0, y_0)$$

$$= 1 + 6 \cdot 3 \cdot \ln(3 \cdot 2 - 5)$$

$$\boxed{= 1}$$

$$f_x = \frac{z}{2x} (1 + 6x \ln(xy - 5)) \stackrel{y \text{ const}}{=} 6 \ln(xy - 5) + 6x \left(\frac{1}{xy - 5} \right) \cdot y$$

$$f_y = \frac{z}{2y} (1 + 6x \ln(xy - 5)) \stackrel{x \text{ const}}{=} 0 + 6x \cdot \frac{z}{2y} \ln(xy - 5)$$
$$= \frac{6x^2}{xy - 5}$$

$$f_x(3, 2) = \overbrace{6 \ln(3 \cdot 2 - 5)}^0 + \frac{6 \cdot 3 \cdot 2}{3 \cdot 2 - 5} \boxed{= 36}$$

$$f_y(3, 2) \boxed{= 54}$$

$$\Delta x = 3.005 - 3 = 0.005 \quad \Delta y = -0.005$$

$$z \approx z_0 + f_x(3, 2) \cdot \Delta x + f_y(3, 2) \Delta y =$$

$$\boxed{= 1 + 36 \cdot (0.005) + 54(-0.005)}$$

Week 4 Review

b) $z - z_0 = f_x(x - x_0) + f_y(y - y_0)$

① $z_0 = f(1, 6)$

② $z = 1 + 36(x - 1) + 6(y - 6)$