

Aufgabe 2)

$$a) f(x) = \left(5 - \frac{1}{x}\right)^2$$

$$f'(x) = 2 \left(5 - \frac{1}{x}\right)^2 \cdot \frac{1}{x^2}$$
$$= \underline{\underline{\frac{2}{x^2} \left(5 - \frac{1}{x}\right)^2}}$$

$$b) f(x) = \sqrt{1 + (e^x)^2}$$

$$f'(x) = \frac{1}{2\sqrt{1 + (e^x)^2}} \cdot (2e^x \cdot e^x)$$
$$= \underline{\underline{\frac{e^{2x}}{\sqrt{1 + (e^x)^2}}}}$$

Aufgabe 4)

$$f(x) = \frac{x}{6} \sqrt{-x + 30}$$

$$f'(x) \stackrel{!}{=} 0$$

$$\frac{x}{6} \sqrt{-x + 30} = 0$$

$$\underline{x=0} \quad \vee \quad \sqrt{-x + 30} = 0 \quad |(\)^2$$

$$-x + 30 = 0 \quad | +x$$

$$\underline{30 = x_2}$$

$$V = \pi \int_{x_1}^{x_2} (f(x))^2 dx = \pi \int_0^{30} \left(\frac{x}{6} \sqrt{-x + 30}\right)^2 dx = \pi \int_0^{30} \frac{x^2}{36} \cdot (-x + 30) dx$$

$$= \pi \int_0^{30} \left(-\frac{x^3}{36} + \frac{30x^2}{36}\right) dx = \pi \int_0^{30} \left(-\frac{x^3}{36} + \frac{5}{6}x^2\right) dx$$

$$= \pi \left[-\frac{1}{144}x^4 + \frac{5}{18}x^3\right]_0^{30} = \pi \left[-\frac{1}{144}(30)^4 + \frac{5}{18} \cdot (30)^3\right]$$

$$= \pi [-5625 + 7500] = \pi \cdot 1875 \approx \underline{\underline{5890,48}}$$

A: Das Volumen beträgt ca. 5890,48 Volumen-Einheiten!