S 74 Nr. 10 $f(x) = \frac{1}{b}\cdot(d-x^2)^2$

a) $\left.\begin{array}{l} f(0)=50 \\ f(30)=0 \end{array}\right\} \Rightarrow f(0) = \frac{1}{b}(d-0^2)^2 = 50 = \frac{1}{b}\cdot d^2 \Rightarrow b = \underbrace{\frac{d^2}{50}}_{\text{einsetzen in Gleichung II}}$

$f(30) = \frac{1}{b}(d-30^2)^2 = 0$

$$\frac{1}{\frac{d^2}{50}}\cdot(d-30^2)^2 = 0$$

umständlich

$$\frac{50}{d^2}(d^2-1800d+810000)=0$$

$$50 - \frac{90000}{d} + \frac{40{,}500{,}000}{d^2} = 0 \quad |\cdot d^2$$

$$50d^2 - 90000d + 40.500.000 = 0 \quad |:50$$

$$d^2 - 1800d + 810000 = 0$$

$$\underline{\underline{d_{1/2}}} = +900 \pm\sqrt{810.000-810000} = \underline{\underline{900}}$$

schneller $\left\{ \frac{50}{d^2}\cdot(d-30^2)^2 = 0;\ d\neq 0 \Rightarrow (d-30^2)=0 \right.$

$$\Rightarrow \underline{\underline{d=900}}$$

aus Gleichung I folgt $\underline{\underline{b}} = \frac{d^2}{50} = \frac{900^2}{50} = \underline{\underline{16200}}$

---

b) $f'(0)=0$ und $f'(30)=0$ dann Einmündung knickfrei

$f(x) = \frac{1}{16200}\cdot(900-x^2)^2 \Rightarrow f'(x) = \frac{1\cdot 2}{16200}(900-x^2)^1\cdot(-2x)$

Kettenregel

$f'(x) = \frac{-4x}{16200}\cdot(900-x^2) = -\frac{2}{9}x + \frac{1}{4050}\cdot x^3$

$\underline{\underline{f'(0)}} = -\frac{2}{9}\cdot 0 + \frac{1}{4050}\cdot 0^3 = \underline{\underline{0}}$; $\underline{\underline{f'(30)}} = -\frac{2}{9}\cdot 30 + \frac{1}{4050}\cdot 30^3 = \underline{\underline{0}}$

$\Rightarrow$ Die Verbindungsstraße mündet knickfrei in die bestehenden Straßen