S. 41 / 9

b) $\int_0^z \left(-(x-2)^2+4-mx\right)dx = \int_z^4 \overbrace{\left(mx+x^2-4x\right)}^{mx-\left(-(x-2)^2+4\right)} dx$

linke Seite: $\int_0^z \left(-x^2+4x-mx\right)dx = \int_0^z \left(-x^2+(4-m)\cdot x\right)dx = \left[-\frac{1}{3}x^3+\frac{4-m}{2}x^2\right]_0^z =$

$= -\frac{1}{3}z^3+\frac{4-m}{2}z^2$

rechte Seite: $\int_z^4 \left(x^2+(m-4)x\right)dx = \left[\frac{1}{3}x^3+\frac{m-4}{2}x^2\right]_z^4 = \frac{64}{3}+\frac{m-4}{2}\cdot 16-\frac{1}{3}z^3-\frac{(4-m)}{2}z^2$

$-\frac{1}{3}z^3+\frac{4-m}{2}z^2 \overset{!}{=} \frac{64}{3}+8m-32-\frac{1}{3}z^3+\frac{4-m}{2}z^2 \quad \left| +\frac{1}{3}z^3 - \frac{4-m}{2}z^2\right.$

$\frac{96}{3}-\frac{64}{3} = 8m$

$\frac{32}{3} = 8m \quad | :8$

$\frac{4}{3} = m$

a) Schnittstelle von Gerade und Parabel:

$-(x-2)^2+4 = 0{,}5x$

$-(x^2-4x+4)+4 = 0{,}5x$

$-x^2+4x-4+4 = 0{,}5x \quad | -0{,}5x$

$-x^2+3{,}5x = 0$

$-x(x-3{,}5) = 0 \quad \Rightarrow x_{S1}=0 ; x_{S2}=3{,}5$

$A_1 = \int_0^{3{,}5}\left(p(x)-g(x)\right)dx = \int_0^{3{,}5}\left(-x^2+3{,}5x\right)dx = \left[-\frac{1}{3}x^3+1{,}75x^2\right]_0^{3{,}5}$

$= -\frac{1}{3}\cdot 3{,}5^3+1{,}75\cdot 3{,}5^2-0 = \frac{343}{48} \approx 7{,}15\ FE$

$A_2 = \left|\int_{3{,}5}^4 \left(-x^2+3{,}5x\right)dx\right| = \left|\left[-\frac{1}{3}x^3+1{,}75x^2\right]_{3{,}5}^4\right| = \left|-\frac{1}{3}\cdot 4^3+1{,}75\cdot 4^2-\underbrace{\left(-\frac{1}{3}\cdot 3{,}5^3+1{,}75\cdot 3{,}5^2\right)}_{(\rightarrow A1!)}\right|$

$= \left|-\frac{1}{3}\cdot 64+1{,}75\cdot 16-\frac{343}{48}\right| = \left|-\frac{23}{48}\right| = \frac{23}{48} \approx 0{,}48$