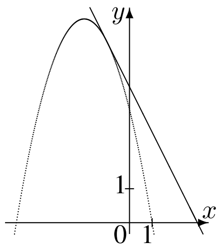
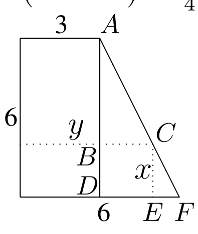
9. Klasse Lösungen — 09
Kompakt-Überblick zum Grundwissen — K

1. (a) $\frac{\sqrt{144}-\sqrt{44}}{2} = \frac{12-2\sqrt{11}}{2} = 6-\sqrt{11}$
   (b) $\ldots = (x-1)^{-\frac{1}{2}} \cdot (x-1)^{-\frac{1}{2}}$
   $= (x-1)^{-1} = \frac{1}{x-1}$
   (c) $\ldots = \frac{a^5(1-a^2)}{(a+1)^2} = \frac{a^5(1+a)(1-a)}{(a+1)^2} =$
   $= \frac{a^5(1-a)}{1+a}$
2. Enge Parabel mit den Nullstellen 1 und 3, also Scheitel bei $(2|-2)$. Spiegelung: $y = -2(x-3)(x-1)$.
3. Scheitel S mit quadr. Ergänzung: $y = -[x^2+4x-5] = -[(x+2)^2-9] = -(x+2)^2+9$, also $S(-2|9)$.
   $-x^2-4x+5 = -2x+6$;

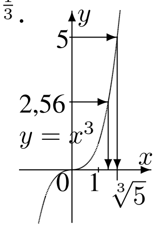
   

   $0 = x^2+2x+1$; $x_{1/2} = -1$ (1 Lsg.) Anschaulich: Die Gerade $y = -2x+6$ berührt die Parabel in einem Punkt.
4. Sei x das Alter des Klavierlehrers. Mein Alter: $x-22$.
   $x\cdot(x-22) = 555$; $x^2-22x-555 = 0$; $x_{1/2} = 11 \pm 26$. Also ist er 37.
5. H: Herz gezogen. K: Karo gezogen.

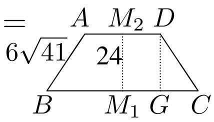
	H	$\overline{H}$	
K	$\frac{1}{52}$	$\frac{12}{52}$	$\frac{13}{52} = \frac{1}{4}$
$\overline{K}$	$\frac{3}{52}$	$\frac{36}{52}$	$\frac{39}{52}$
	$\frac{4}{52} = \frac{1}{13}$	$\frac{48}{52}$	1

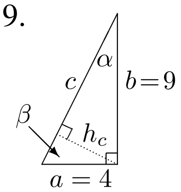
   $P(H \cup K) = \frac{1}{52} + \frac{12}{52} + \frac{3}{52} = \frac{16}{52} \approx 31\,\%$
   Oder: $P(H \cup K) = P(H) + P(K) - P(H \cap K) = \frac{1}{4} + \frac{1}{13} - \frac{1}{52} = \frac{4}{13}$
6. 

   $\Delta ADF \sim \Delta ABC$
   $\frac{\overline{DF}}{\overline{AD}} = \frac{\overline{BC}}{\overline{AB}}$
   $\frac{3}{6} = \frac{y-3}{6-x}$ (oder: $\Delta ADF \sim \Delta CEF$: $\frac{3}{6} = \frac{6-y}{x}$)
   Quadrat: $x = y$, also $\frac{3}{6} = \frac{x-3}{6-x}$
   Kreuzweise mult.: $3(6-x) = 6(x-3)$
   $18-3x = 6x-18$; $36 = 9x$; $x = 4$
7. $\sqrt[3]{1{,}6^2} : \sqrt[3]{5} = (1{,}6^2)^{\frac{1}{3}} : 5^{\frac{1}{3}} = ((\frac{8}{5})^2)^{\frac{1}{3}} : 5^{\frac{1}{3}} = (\frac{8^2}{5^2} : 5)^{\frac{1}{3}} = (\frac{8^2}{5^3})^{\frac{1}{3}} = \frac{8^{\frac{2}{3}}}{5^{\frac{3}{3}}} = \frac{(\sqrt[3]{8})^2}{5} = \frac{4}{5}$.
   Oder: Verwendung der x^y-Taste und $\sqrt[3]{1{,}6^2} : \sqrt[3]{5} = (1{,}6^2)^{\frac{1}{3}} : 5^{\frac{1}{3}}$.
   Oder näherungsweise: Zeichnung des Graphen zu $y = x^3$ und Ablesen von $\sqrt[3]{2{,}56}$ und $\sqrt[3]{5}$.

8. ΔGCD: $24^2 + \overline{GC}^2 = (6\sqrt{41})^2$; $\overline{GC} = 30$
   Also $\overline{AD} = 40$.

   Ferner $\overline{EF} = (120-80) : 2 = 20$.
   Die Punkte EFM_2D bilden eine kleine Pyramide. Im Dreieck M_2DE (mit rechtem Winkel bei M_2) gilt dabei: $\overline{ED}^2 = \overline{M_2D}^2 + \overline{M_2E}^2 = 656$.
   ΔEDF (rechter Winkel bei E): $\overline{DF}^2 = \overline{ED}^2 + \overline{EF}^2 = 656 + 20^2 = 1056$, also $\overline{DF} = \sqrt{1056} \approx 32{,}5$
9. 

   $c = \sqrt{a^2+b^2} =$
   $= \sqrt{4^2+9^2} \approx 9{,}85$
   $\tan\alpha = \frac{4}{9} \approx 0{,}44$, also $\alpha \approx 23{,}96°$
   $\beta = 180° - \gamma - \alpha \approx 66{,}04°$
   $\sin\alpha = \frac{h_c}{b}$, also $h_c = b\sin\alpha \approx 3{,}66$
   Andere Wege: $\cos\beta = \frac{h_c}{a}$ oder Fläche $A = \frac{1}{2}ab = \frac{1}{2}ch_c$, also $h_c = \frac{ab}{c}$
10. (a) $-5{,}5 = 8x$; $x = -\frac{5{,}5}{8} = -\frac{11}{16}$
    (b) $2x^2+3x-2 = 0$; $x_{1/2} = \frac{-3\pm\sqrt{9-4\cdot2\cdot(-2)}}{2\cdot2}$; $x_1 = \frac{1}{2}$; $x_2 = -2$
    (c) $x(x-9) = 0$; $x_1 = 0$; $x_2 = 9$
    (d) $D = \mathbb{R}\backslash\{0;-9\}$; $\overset{\text{Mult. mit HN}}{\underset{x(x-9)}{}}$:
    $x+9+8x = x(x+9)$;
    $x^2 = 9$; $L = \{-3;3\}$
    (e) Zwei Lösungen: $x_{1/2} = \pm 7$