Handlösungen

1 $\sin(x+\beta) = \sin(x)\cdot\cos(\beta) + \cos(x)\cdot\sin(\beta)$

$\Rightarrow \cos(x+\beta) = \cos(x)\cdot\cos(\beta) - \sin(x)\cdot\sin(\beta)$

$\rightsquigarrow$ Additionstheoreme

2 **a** $f(x) = \frac{1}{5}x^5 - \frac{1}{4}x^4 - \frac{1}{3}x^3 + \frac{1}{2}x^2$

$f'(x) = x^4 - x^3 - x^2 + x = 0$

$\Rightarrow x_1 = -1,\ x_2 = 0,\ x_3 = x_4 = 1$

$\nearrow$ Max. Min Terrasse $\nearrow$

b $f(x) = \frac{1}{12}x^4 - \frac{1}{9}x^3 - x^2 + 1$

$f'(x) = \frac{1}{3}x^3 - \frac{1}{3}x^2 - 2x = 0$

$\Rightarrow x_1 = -2,\ x_2 = 0,\ x_3 = 3$

$\searrow$ Min. Max. Min. $\nearrow$

c $f(x) = \frac{1}{50}x^2(x-5)(x-9) = \frac{x^4}{50} - \frac{14}{50}x^3 + \frac{45}{50}x^2 = \dots$

$f'(x) = \frac{4}{50}x^3 - \frac{42}{50}x^2 + \frac{90}{50}x = \dots = 0$

$\Rightarrow x_1 = 0,\ x_2 = 3,\ x_3 = 7{,}5$

$\searrow$ Min Max Min $\nearrow$

3 $f(x) = a\,(x^2 - 5x)$, NS $x_1 = 0,\ x_2 = 5$

Max. $x_3 = 2{,}5$

$f(2{,}5) = 25 = a\cdot 2{,}5\cdot(2{,}5-5) = a\cdot(-2{,}5)^2$

$\Rightarrow a = -\frac{25}{2{,}5\cdot 2{,}5} = -\frac{10}{2{,}5} = -4$

$\rightsquigarrow f(x) = -4x^2 + 20x$ (Kontr. $f'(x) = -8x + 20 = 0,\ x = 2{,}5$)

$A(x) = f(x)\cdot(5-2x) = (-4x^2+20x)(5-2x) = 8x^3 - 60x^2 + 100x$

$A'(x) = 24x^2 - 120x + 100 = 0$

$\Rightarrow x_{4,5} = \frac{5}{6}(3 \pm \sqrt{3}) \approx \begin{cases} 1{,}0566\ldots & \leftarrow \text{o.k.} \\ 3{,}943\ldots & \leftarrow \text{Wert} > 2{,}5\ !! \end{cases}$

4 $A(x) = x\cdot(16-2x)\cdot(6-2x) = 4x^3 - 44x^2 + 96x$

$A'(x) = 12x^2 - 88x + 96 = 0 \Rightarrow \underline{\underline{x_1 = \frac{4}{3}}},\ \underbrace{x_2 = 6}_{\text{Breite!!!}}$