

Problem 1 (14 points)

Graph the parabola $y = -x^2 + x + 2$, clearly marking x - and y -intercepts and the vertex in your picture.

Problem 2 (14 points)

What is the largest possible area for a right triangle in which the sum of the lengths of the two shorter sides is 80 cm?

Problem 3 (16 points)

Find all values of x such that $\log_6 x + \log_6(x + 1) \leq 1$. Remember to think about the domain!

Problem 4 (12 points)

Solve the equation

$$9^{2x+1} = 3^{2x+5}.$$

Problem 5 (10 points)

Write the following logarithm as a sum or difference of simpler logarithms, such that no products, quotients, radicals, or powers occur inside a logarithm.

$$\log \frac{(x+2)^2 \sqrt{x}}{(3x-2)^{3/2}} =$$

Problem 6 (18 points)

Graph the following rational function. Include all intercepts and asymptotes, as well as the precise coordinates of any point where the function crosses an asymptote. You may find it helpful to use other tools, too.

$$y = \frac{(x+2)(x-4)}{(x-2)(x+1)}$$

Problem 7 (16 points)

Match each function below to its graph on the following page.

_____ $y = x^2(x+2)$

_____ $y = x(x+2)(-x+2)$

_____ $y = x(x+2)^2$

_____ $y = x(x+2)^2(x-2)^2$

_____ $y = 2^x - 2$

_____ $y = 1 - \left(\frac{1}{2}\right)^x$

_____ $y = \log_2(x+1) - 1$

_____ $y = x^2(x+2)(-x+2)$

All straight lines in these graphs are either coordinate axes or asymptotes.

