

University of Waterloo  
Faculty of Mathematics

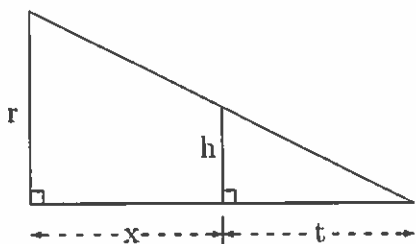
Sample Mathematics Readiness Test

The Mathematics Readiness Test is taken by all first-year students in the Faculties of Mathematics and Engineering during the first week of class in September. It is meant as a diagnostic tool that students can use to identify areas where they might need extra help. Answers only are marked. The test is out of 15. The average for this sample test was 10.9/15.

1. Find the roots of the equation:  $7x^2 - 6x - 3 = 0$ .
2. Solve:  $|2x + 1| = 4$ .
3. Simplify:

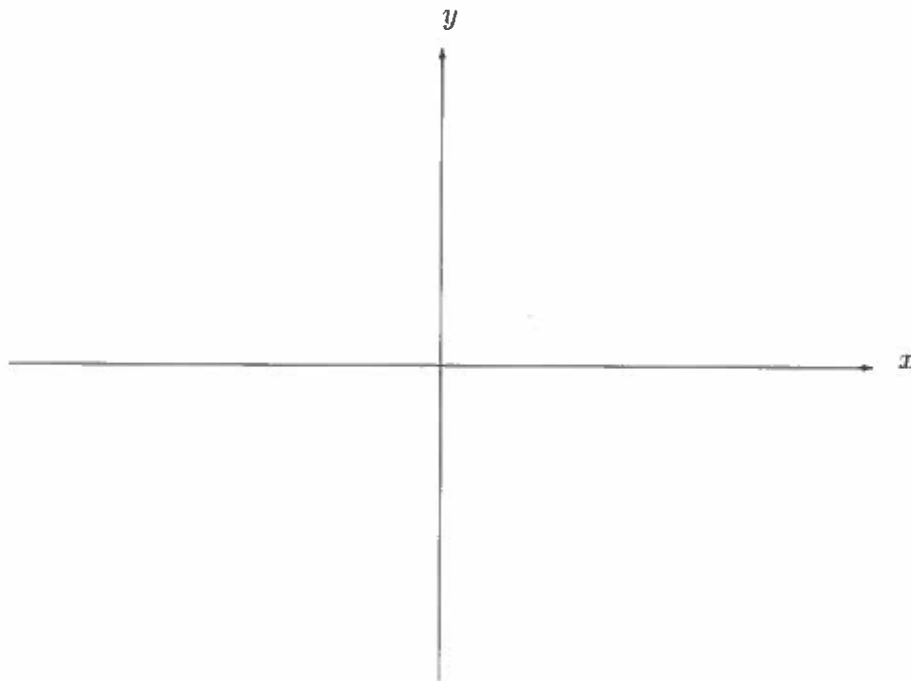
$$\frac{\frac{a+b}{a-b} + \frac{a-b}{a+b}}{\frac{a}{b} + \frac{b}{a}}$$

4. Find an equation of the form  $y = mx + b$  of the line through the point  $(1, -7)$  with slope  $-1/2$ .
5. Find the points of intersection between the curves:  $2x - y = -5$  and  $y = x^2 + 2$ .
6. Solve:  $x^2 - 6x + 8 < 0$ .
7. Solve:  $10^{2x-3} = \sqrt{10}$ .
8. Solve:  $\log_5(x + 9) = 2 \log_5(x - 3)$ .
9. Solve:  $e^{x-3} = 2$ .
10. Find  $x$  and  $y$  such that the points  $A(-1, 3)$ ,  $B(x, 9)$  and  $C(5, y)$  are collinear with point  $B$  lying midway between points  $A$  and  $C$ .
11. Express  $x$  in terms of the other variables in the diagram below:



12. Determine the length  $x$  indicated in the diagram.

13. Sketch the curve  $y = x^3 - 3x^2 - 4x$  and label all intercepts. Do not find the coordinates of the local maximum and minimum points.



14. Find all values of  $x$ , in radians, such that  $2 \cos^2 x + 5 \cos x - 3 = 0$  where  $0 \leq x \leq \pi$ .

15. The temperature of an object, initially at  $10^\circ\text{C}$ , rises at a rate of  $8^\circ\text{C}$  per minute for a time, then drops at a rate of  $4^\circ\text{C}$  per minute for half that amount of time. If its final temperature is  $60^\circ\text{C}$ , how much time has passed in total?