Answers to *Building Polynomials* Activity Sheets

Sheet 1

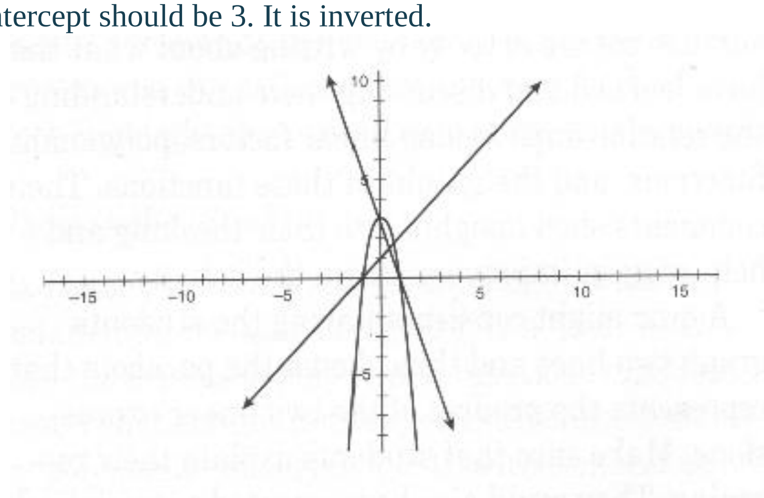
1. $y = (-2/3)x + 2$ or an equivalent form.
2. Answers will vary. For example, students can use the slope-intercept form of the point-slope form to find the equation.
3. $y = (-2/3)x + 2$
4. $y = (-2/3)(x - 3)$
5. Lines will vary.
6. $-b/m$ is the x-intercept.
7. Answers will vary.

8.-10. Answers will vary. Students may not immediately see that the product of the two linear expressions gives a parabolic expression, nor do they necessarily recognize that the parabola and the lines share the same x-intercepts. Questions 11 and 12 are meant to highlight the intercepts for those students who have not made the connection.

11. The lines have the same x-intercepts as the parabola.
12. The y-intercept of the parabola is the product of the y-intercepts of the lines.

13.-18. Answers will vary. The teacher should assist students who are placing their paper strip incorrectly.

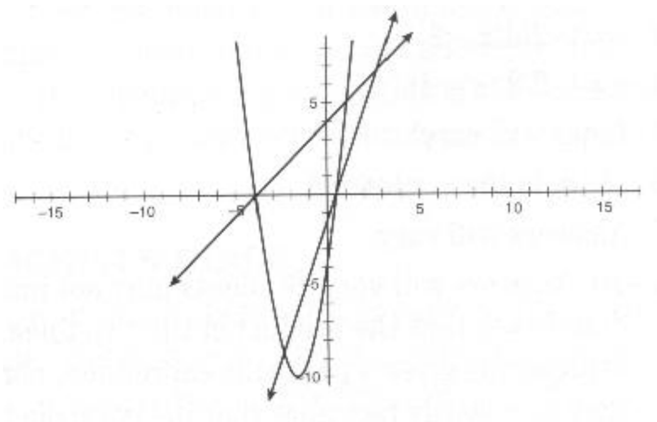
19. For any section of the graph, the product of the signs of the y-coordinates of the linear functions is the same as the sign of the y-coordinates of the parabola in that section.
20. A sample graph is given below. The parabola should have the same x-intercepts as the lines have, and the y-intercept should be 3. It is inverted.



21. Yes. Explanations will vary, but students should state again at least some of the relationships among the graphs found in questions 10 to 20.
22. One line will have a positive slope, and the other will have a negative slope.

Sheet 2

1. The lines drawn should go through the x-intercepts of the parabola. The product of the y-intercepts of the lines should equal the y-intercept of the parabola. The parabola should have negative y-coordinates when just one of the lines has negative y-coordinates. A possible pair of lines is given below.



2. Students may not have considered both the x-intercepts and the y-intercepts when sketching their graphs. They certainly could have used a combination of y-coordinates for a value of x 0, but using the y-intercepts is easier.
3. Students should also consider the signs of the y-coordinates for various sections of the graph.
4. Equations will vary. One possibility is $y = x + 4$ and $y = 2x - 1$. Another possibility is $y = (1/2)x$ and $y = 4x - 2$. For all equations, the x-intercepts should be -4 and 1/2 and the product of the y-intercepts should be -4.
5. The quadratic expression should be the product of the linear expressions given in question 4. If the linear expressions were $x + 4$ and $2x -1$, then the quadratic function would be $y = 2x^2 + 7x - 4$.
6. Yes. See remarks in the text about generating other sets of lines by distributing unit factors.
7. The answer will be the same as the one for question 5.
8. Students should notice that the product is the same even though the lines have changed.
9.-10. The graph should show two lines, both having an x-intercept of 3. The product of the y-intercepts of the lines is 9. Two lines are needed, and since only one x-intercept exists, both lines must go through that intercept. The y-intercepts of the lines must have a product of 9. Note that the two lines could both be $y = -x + 3$; could both be $y = x - 3$; or could differ, for example, $y = (1/3)x - 1$, and $y = 3x - 9$.
11.-12. No lines can be drawn that would be components of the quadratic function given.
13. The absence of x-intercepts implies that no real roots exist, that is, lines cannot be drawn, because the quadratic equation cannot be factored into linear expressions over the real numbers.

Sheet 3

1. Equations and graphs will vary.
2. A cubic expression
3.-4. The graph drawn should go through the x-intercepts of all three lines. The product of the y-intercepts of the lines gives the y-intercept of the cubic. Help in graphing the cubic can also be obtained by observing the signs of the y-coordinates.
5.-6. Each line should pass through one of the x-intercepts. The product of the y-intercepts of the lines should be -6. Exactly one or exactly three of the lines will have negative y-coordinates when the y-coordinates on the cubic are negative. One such set of lines would be $y = x - 1$, $y = -x - 3$, and $y = -2x -2$.