

$$y = ax^2 + bx + c$$

Advanced Algebra

Unit 4 Quadratics Assignment #20

- I can write the equation of a parabola given 2 points and the y-intercept
- I can write the equation of a parabola given 3 points

Write the equation of the following parabolas. You will be using systems of equations and Elimination.

1) The y intercept of the parabola is -24. One of the roots is 2. The parabola passes through the point (5,81)

(0, -24) (2, 0) (5, 81)

$$4a + 2b - 24 = 0$$

$$25a + 5b - 24 = 81$$

$$12 + 2b = 24$$

$$2b = 12$$

$$b = 6$$

$$(5) \quad 4a + 2b = 24$$

$$(2) \quad 25a + 5b = 105$$

$$20a + 10b = 120$$

$$-50a + 10b = -210$$

$$-30a = -90$$

$$a = 3$$

$$y = 3x^2 + 6x - 24$$

2) The parabola passes through the points (0, -48) (4, 0) and (5, 22)

$$y = ax^2 + bx + c$$

$$16a + 4b - 48 = 0$$

$$25a + 5b - 48 = 22$$

$$32 + 4b = 48$$

$$4b = 16$$

$$b = 4$$

$$(5) \quad 16a + 4b = 48$$

$$(4) \quad 25a + 5b = 70$$

$$80a + 20b = 240$$

$$-100a + 20b = 280$$

$$-20a = -40$$

$$a = 2$$

$$y = 2x^2 + 4x - 48$$

$$y = 6x^2 + 12x - 48$$

3) The parabola passes through the points (3, 42) (5, 162) (8, 432)

(3, 42) ① $9a + 3b + c = 42$

② $25a + 5b + c = 162$

③ $64a + 8b + c = 432$

Use 1 & 2

$$9a + 3b + c = 42$$

$$-25a + 5b + c = 162$$

$$-16a - 2b = -120$$

Use 2 & 3

$$25a + 5b + c = 162$$

$$-64a + 8b + c = 432$$

$$-39a - 3b = -270$$

$$-16(6) - 2b = -120$$

$$-96 - 2b = -120$$

$$-2b = -24$$

$$b = 12$$

(3) $-16a - 2b = -120$

(2) $-39a - 3b = -270$

now use these

$$-48a + 6b = -360$$

$$+78a + 6b = 1540$$

$$30a = 180$$

$$a = 6$$

4) The parabola passes through the points (5, 26) (8, -16) and (11, -58)

$$y = ax^2 + bx + c$$

- ① $26 = 25a + 5b + c$
- ② $-16 = 64a + 8b + c$
- ③ $-58 = 121a + 11b + c$

58 178 370

Use 1 & 2

$$\begin{aligned} 25a + 5b + c &= 26 \\ -64a + 8b + c &= -16 \end{aligned}$$

$$\boxed{-39a - 3b = 42}$$

Use 2 & 3

$$\begin{aligned} 64a + 8b + c &= -16 \\ -121a + 11b + c &= -58 \end{aligned}$$

$$\boxed{-57a - 3b = 42}$$

now use these

$$\begin{aligned} -39a - 3b &= 42 \\ -57a - 3b &= 42 \end{aligned}$$

5) The parabola passes through (6, 72) (11, -153) and (17, -621)

$$y = ax^2 + bx + c$$

- 1) $36a + 6b + c = 72$
- 2) $121a + 11b + c = -153$
- 3) $289a + 17b + c = -621$

Use 1 & 2

$$\begin{aligned} 36a + 6b + c &= 72 \\ -121a + 11b + c &= -153 \end{aligned}$$

$$\boxed{-85a - 5b = 225}$$

$c = 144$

$$\boxed{y = -3x^2 + 6x + 144}$$

$$\begin{aligned} -85(-3) - 5b &= 225 \\ 255 - 5b &= 225 \\ -5b &= -30 \\ \underline{b = 6} \end{aligned}$$

Use 2 & 3

$$\begin{aligned} 121a + 11b + c &= -153 \\ -289a + 17b + c &= -621 \end{aligned}$$

$$\boxed{-168a - 6b = 468}$$

$$(6) \quad -85a - 5b = 225$$

$$(5) \quad -168a - 6b = 468$$

$$\begin{aligned} -510a - 30b &= 1350 \\ +840a + 30b &= 2340 \end{aligned}$$

$$330a = -990$$

$$\underline{a = -3}$$

6) The parabola has a y intercept of 160. It has root at 2 and it passes through (6, -560)

$$(0, 160) \quad (2, 0) \quad (6, -560) \quad y = ax^2 + bx + c$$

$$4a + 2b + 160 = 0$$

$$36a + 6b + 160 = -560$$

$$(3) \quad 4a + 2b = -160$$

$$36a + 6b = -720$$

$$12a + 4b = -480$$

$$-36a + 4b = +720$$

$$\underline{-24a = 240}$$

$$\underline{a = -10}$$

$$b = -60$$

$$\boxed{y = -10x^2 - 60x + 160}$$