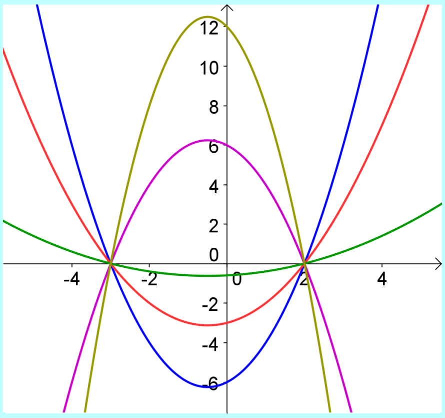
Families of Quadratic Relations

Do the zeroes of a quadratic relation provide sufficient information to determine its equation?



No. All of the graphs shown have the same zeroes at 2 and -3.

They are part of the same family of quadratic relations.

To determine the equation of a particular quadratic, another point is needed.

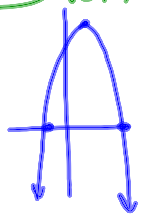
Feb 6-3:52 PM

Families of Quadratic Relations

Feb 14/2012

Ex.1 Find the equation of a parabola with roots of -4 and 18 and an optimum value of 100.

y-coord of vertex



$y = a(x-s)(x-t)$

$y = a(x-(-4))(x-(18))$

$y = a(x+4)(x-18)$

$x_{vertex} = MP_{zeroes}$

$= \frac{-4+18}{2}$

$x_v = 7 \longrightarrow V(7, 100)$

Sub $(7, 100)$

$100 = a(7+4)(7-18)$

$100 = a(11)(-11)$

$\frac{100}{-121} = \frac{-121}{-121} a$

$a = -\frac{100}{121}$

$\therefore y = -\frac{100}{121}(x+4)(x-18)$

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Ex.2 Determine the equation, in factored form, of the parabola that goes through the point (-5, 10) with zeroes at -8 and 5.

$$y = a(x-(-8))(x-(5))$$
$$y = a(x+8)(x-5)$$
sub$(-5, 10)$
$$10 = a((-5)+8)((-5)-5)$$
$$10 = a(3)(-10)$$
$$10 = -30a$$
$$a = -\frac{10}{30}$$
$$a = -\frac{1}{3} \qquad \therefore y = -\frac{1}{3}(x+8)(x-5)$$

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Ex.3 Determine the equation of the quadratic relation, in standard form, that passes through (2, 5) and has roots of $1+\sqrt{5}$ and $1-\sqrt{5}$.

$$y = a(x-s)(x-t)$$
$$y = a(x-(1+\sqrt{5}))(x-(1-\sqrt{5}))$$
sub$(2,5)$
$$5 = a(2-(1+\sqrt{5}))(2-(1-\sqrt{5}))$$
$$5 = a(2-1-\sqrt{5})(2-1+\sqrt{5})$$
$$5 = a(1-\sqrt{5})(1+\sqrt{5})$$
$$5 = a(1-\sqrt{5}+\sqrt{5}-5)$$
$$5 = a(-4)$$
$$a = -\frac{5}{4} \qquad \therefore y = -\frac{5}{4}(x-1-\sqrt{5})(x-1+\sqrt{5})$$
$$y = -\frac{5}{4}((x-1)-\sqrt{5})((x-1)+\sqrt{5})$$
$$(a-b)(a+b)$$
$$a^2-b^2$$
$$(\sqrt{5})^2 = \sqrt{25} = 5$$
$$y = -\frac{5}{4}((x-1)^2-5)$$
$$y = -\frac{5}{4}(x-1)^2 + \frac{25}{4} \qquad V\left(1, \frac{25}{4}\right)$$
$$y = -\frac{5}{4}(x^2-2x+1) + \frac{25}{4}$$
$$(x-1)^2 = (x-1)(x-1) = x$$
$$y = -\frac{5}{4}x^2 + \frac{10}{4}x - \frac{5}{4} + \frac{25}{4}$$
$$y = -\frac{5}{4}x^2 + \frac{10}{4}x + \frac{20}{4} \qquad \text{y-int} = \frac{20}{4} = 5$$
$$y = -\frac{5}{4}x^2 + \frac{5}{2}x + 5$$

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Ex.4 Determine the equation of the quadratic relation, in standard form, that passes through (2, 10) and has roots of $1+\sqrt{5}$ and $1-\sqrt{5}$. How does this differ from Ex.3?

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Assigned Work:

worksheet

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7. $2+\sqrt{3}$ $2-\sqrt{3}$ $(-4,5)$

$y = a(x-s)(x-t)$

$y = a(x-(2+\sqrt{3}))(x-(2-\sqrt{3}))$

$y = a(x-2-\sqrt{3})(x-2+\sqrt{3})$

Sub $(-4,5)$

$5 = a(-4-2-\sqrt{3})(-4-2+\sqrt{3})$

$5 = a(-6-\sqrt{3})(-6+\sqrt{3})$

$5 = a(36-6\sqrt{3}+6\sqrt{3}-3)$

$5 = a(33)$

$a = \frac{5}{33}$

$y = \frac{5}{33}(x-2-\sqrt{3})(x-2+\sqrt{3})$

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5. $V(-2,5)$ $P(4,-8)$

$y = a(x-h)^2 + k$

$y = a(x-(-2))^2 + (5)$

$y = a(x+2)^2 + 5$

Sub $P(4,-8)$

$-8 = a(4+2)^2 + 5$

$-8 = a(36) + 5$

$-13 = 36a$

$a = -\frac{13}{36}$

$\therefore y = -\frac{13}{36}(x+2)^2 + 5$

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4(b) $\sqrt{7}$ $-\sqrt{7}$ $P(-5,3)$

$y = a(x-s)(x-t)$

$y = a(x-\sqrt{7})(x+\sqrt{7})$

Sub $(-5,3)$

$3 = a(-5-\sqrt{7})(-5+\sqrt{7})$

F
O
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L

$3 = a(25 \underbrace{-5\sqrt{7}+5\sqrt{7}}_{=0} - \sqrt{49})$

$3 = a(18)$

$a = \frac{3}{18}$

$a = \frac{1}{6}$

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