MPM 2DX

Date:

Factored Form of a Parabola

Forms of a Quadratic Equation:

1) Vertex Form $a(x-h)^2+k=0$
2) Standard Form $ax^2+bx+c=0$
3) Factored Form (a.k.a. Intercept form) $a(x-s)(x-t)=0$

s & t are roots of parabola

Eg. 1 Solve by factoring: $x^2-2x-3=0$

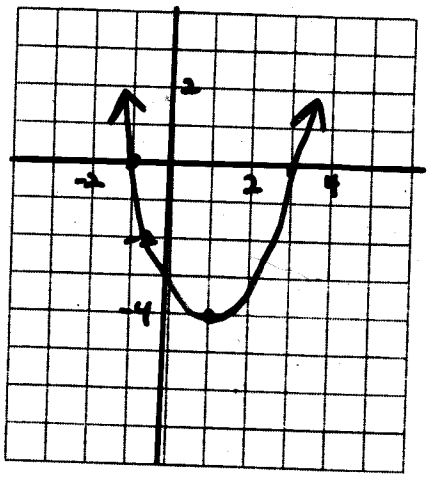
$(x-3)(x+1)=0$

$x=3,\ x=-1$

* graphically these are the points where the parabola crosses the x axis

Determine the vertex of the corresponding quadratic function, without completing the square. Graph the corresponding function.

Since the parabola is symmetrical, the axis of symmetry is half-way between the roots. The vertex is on the axis of symmetry so it has the same x-value.



Find vertex

x-value: * average roots

$x=\frac{3+(-1)}{2}$

$x=1$

y-value: Sub $x=1$ into the corresponding function

$y=x^2-2x-3$

$y=(1)^2-2(1)-3$

$y=-4$

$\therefore$ the vertex is $(1,-4)$

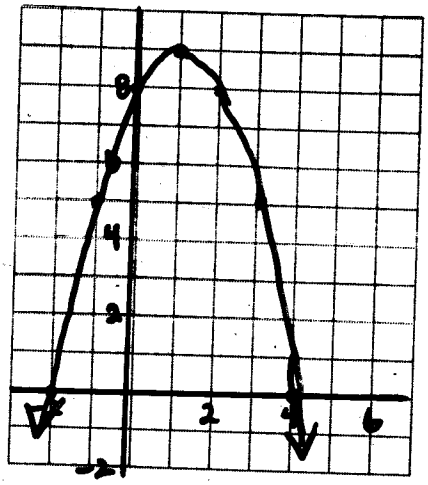
Eg. 2 Given the function $y=-x^2+2x+8$, determine the roots, and graph the parabola, without completing the square. (average roots)

Solve for the roots:

$0=-(x^2-2x-8)$

$0=-(x-4)(x+2)$

$x=4 \quad x=-2$



Vertex:

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

$x=1$

$y=-(1)^2+2(1)+8$

$=-1+2+8$

$y=9$

vertex $(1,9)$

Eg. 3 Write a quadratic ~~equation~~ function in factored form with:

a) roots of -1 and 3 and $\boxed{\text{vertex } (1,4)}$

Given $s=-1$ and $t=3$

$a(x+1)(x-3)=y$

sub $(x,y)=(1,4)$

$a(1+1)(1-3)=4$

$a(2)(-2)=4$

$-4a=4 \therefore a=-1$

$\therefore y=-(x+1)(x-3)$

Quadratic Function

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

b) zeros of $\frac{-5}{3}$ and $\frac{1}{2}$ passing through (1,-2)

Given $s=\frac{-5}{3}$ & $t=\frac{1}{2}$

then $a(3x+5)(2x-1)=y$

sub $(x,y)=(1,-2)$

$a(3(1)+5)(2(1)-1)=-2$

$a(8)(1)=-2$

$8a=-2$

$a=\frac{-1}{4}$

$\therefore y=\frac{-1}{4}(3x+5)(2x-1)$

Eg. 4 If one root is 5, find the value of k and the other root.

$x^2-3x+k=0$

When $x=5$:

$(5)^2-3(5)+k=0$

$25-15+k=0$

$k=-10$

$\therefore x^2-3x-10=0$

$(x-5)(x+2)=0$

$\therefore$ the factors are 5 & -2