#10

Intercept Form-Characteristics

Intercept Form: $y = a(x-p)(x-q)$

*p and q are the zeros

*$(p, 0)$ and $(q, 0)$ are the x-intercepts

FINDING THE AXIS OF SYMMETRY:

*The axis of symmetry is halfway between the zeros.

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

zeros: $3 + -3$

$x = 0$

2. $y = -(x+1)(x+4)$

zeros: $-1 + -4$

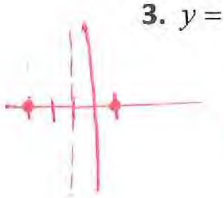
$x = -2.5$

FINDING THE VERTEX:

*Find the axis of symmetry.

*Plug that x-value in to the equation for x to find the y-coordinate of the vertex.

3. $y = -3(x-1)(x+3)$ zeros: $1 + -3$



$x = -1$

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

$= -3(-2)(2)$

$= 12$

$(-1, 12)$

4. $y = (x-2)(x+2)$ zeros: $2 + -2$

$x = 0$

$y = (0-2)(0+2)$

$= (-2)(2)$

$= -4$

$(0, -4)$

FINDING THE EXTREMA:

*Determine whether the parabola opens up or down. *(If there is a negative in front, the graph opens* down *and there is a* maximum*. If there is not a negative in front, the graph opens* up *and there is a* minimum*.)*

*Find the vertex. *(The smallest/largest y-value corresponds to the* y-coordinate *of the vertex.)*

5. $y = (x+5)(x+7)$ ↑↑ zeros: $-5 + -7$

$x = -6$

$y = (-6+5)(-6+7)$

$= (-1)(1)$

$= -1$

min at -1

6. $y = 3(x-2)(x-3)$ ↑↑ zeros: $2 + 3$

$x = 2.5$

$y = 3(2.5-2)(2.5-3)$

$= 3(0.5)(-0.5)$

$= -0.75$

min at -0.75

FINDING Y-INTERCEPT:

*Let x = 0.

7. $y = 4(x-3)(x+5)$

$= 4(0-3)(0+5)$

$= 4(-3)(5)$

$= -60$

$(0, -60)$

8. $y = -2(x-6)(x-8)$

$= -2(0-6)(0-8)$

$= -2(-6)(-8)$

$= -96$

$(0, -96)$

Practice Problems:

Find the vertex, axis of symmetry, extrema, and y-intercept.

9. $y = (x+9)(x-5)$

10. $y = -(x+5)(x-5)$

11. $y = (x-1)(x-4)$

12. $y = -3x^2 + 24x$

13. $y = (x+3)(x+7)$

14. $y = -2(x-10)(x-8)$

15. $y = (x+4)^2 - 7$

16. $y = -4(x+1)(x-6)$

Practice:

9) $y=(x+9)(x-5)$ zeros: $-9, 5$

$x=-2$

$y=(-2+9)(-2-5)$

$=(7)(-7)$

$=-49$

$=(0+9)(0-5)$

$=(9)(-5)$

$=-45$

Vertex: $(-2,-49)$
AOS: $x=-2$
extrema: min at -49
y-int: $(0,-45)$

10) $y=-(x+5)(x-5)$ zeros: $-5, 5$

$x=0$

$y=-(0+5)(0-5)$

$=-(5)(-5)$

$=25$

Vertex: $(0,25)$
AOS: $x=0$
extrema: max at 25
y-int: $(0,25)$

11) $y=(x-1)(x-4)$ zeros: $1, 4$

$x=2.5$

$y=(2.5-1)(2.5-4)$

$=(1.5)(-1.5)$

$=-2.25$

$=(0-1)(0-4)$

$=(-1)(-4)$

$=4$

Vertex: $(2.5,-2.25)$
AOS: $x=2.5$
extrema: min at -2.25
y-int: $(0,4)$

12) $y=-3x^2+24x$

$x=\frac{-(24)}{2(-3)}=\frac{-24}{-6}=4$

$y=-3(4)^2+24(4)$

$=-48+96$

$=48$

Vertex: $(4,48)$
AOS: $x=4$
extrema: max at 48
y-int: $(0,0)$

13) $y=(x+3)(x+7)$ zeros: $-3, -7$

$x=-5$

$y=(-5+3)(-5+7)$

$=(-2)(2)$

$=-4$

$=(0+3)(0+7)$

$=(3)(7)$

$=21$

Vertex: $(-5,-4)$
AOS: $x=-5$
extrema: min at -4
y-int: $(0,21)$

14) $y=-2(x-10)(x-8)$ zeros: $10, 8$

$x=9$

$y=-2(9-10)(9-8)$

$=-2(-1)(1)$

$=2$

$=-2(0-10)(0-8)$

$=-2(-10)(-8)$

$=-160$

Vertex: $(9,2)$
AOS: $x=9$
extrema: max at 2
y-int: $(0,-160)$

15) $y=(x+4)^2-7$

V: $(-4,-7)$
AOS: $x=-4$
extrema: min at -7
y-int: $(0,9)$

$=(0+4)^2-7$

$=(4)^2-7$

$=16-7$

$=9$

16) $y=-4(x+1)(x-6)$ zeros: $-1, 6$

$x=2.5$

$y=-4(2.5+1)(2.5-6)$

$=-4(3.5)(-3.5)$

$=49$

$=-4(0+1)(0-6)$

$=-4(1)(-6)$

$=24$

Vertex: $(2.5,49)$
AOS: $x=2.5$
extrema: max at 49
y-int: $(0,24)$