***Pre-Calculus 11***

***Unit 4: Analyzing Quadratic Functions***

***Worksheet 4.4—Quadratic Functions of the Form*** $y=a\left(x-p\right)^{2}+q$ ***Part II***

1. For the following quadratic functions, identify the following:

 i) the direction of the opening

 ii) the vertex

 iii) the equation of the axis of symmetry

 iv) the domain and range of the function

1. $y=3\left(x-2\right)^{2}-5$ b) $y=-4x^{2}+3$

c) $y=-\frac{1}{2}\left(x+3\right)^{2}$ d) $y=\frac{3}{4}\left(x-2\right)^{2}+1$

2. Graph each of the quadratic functions from #1 above.

3. Determine a quadratic function that has vertex $\left(-1,3\right)$ and passes through the point $\left(2,0\right)$

4. Determine a quadratic function that has vertex $\left(5,-4\right)$ and passes through the point $\left(3,8\right)$

5. Determine the equations of the following graphs of quadratic functions.

1.  b)

c) d)

e) f)



g) h)



i) j)

6. Find the equation of the parabola with vertex $\left(0, 0\right)$ and passes through the point $\left(\frac{3}{2}, \frac{1}{3}\right)$

7. Determine the value of $q$ so that the graph of $y=\left(x+3\right)^{2}+q$ passes through the

 point $\left(1, 20\right).$

8. The vertex of a parabola is $\left(-2,-4\right)$. One x-intercept is 7. What is the other x-intercept?

9. The x-intercepts of a parabola are 5 and $-7$. What is the equation of the axis of symmetry?

 Explain.

10. Two points on a parabola are $\left(4,-1\right)$ and $(-10,-1)$. What is the equation of the axis of

 symmetry?

11. Find the equation of the parabola, with axis of symmetry the y-axis, which passes through

 the points $A\left(-2,1\right)$ and $B(4,-5)$

12. The height of a soccer ball, $h(d)$ metres, as a function of the horizontal distance, $d$ metres,

 the ball travels until it first hits the ground is described by the function

$$h\left(d\right)=-0.025\left(d-20\right)^{2}+10$$

1. What is the maximum height of the ball?
2. What is the horizontal distance of the ball from the kicker when it reaches its maximum height?
3. How far does the ball travel horizontally form when it is kicked until it hits the ground?
4. What is the height of the ball when it is 10m horizontally from the kicker?
5. Would an opposing player positioned under the path of the ball 34m from the kicker be able to head the ball? Explain.
6. If the origin were placed at the vertex of the parabola, what would the equation of the curve be?

***Solutions***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. | a) $y=3\left(x-2\right)^{2}-5$ | b) $y=-4x^{2}+3$ | c) $y=-\frac{1}{2}\left(x+3\right)^{2}$ | d) $y=\frac{3}{4}\left(x-2\right)^{2}+1$ |
| i) direction of opening  | Up | Down | Down | Up |
| ii) vertex | $$\left(2,-5\right)$$ | $$\left(0,3\right)$$ | $$\left(-3,0\right)$$ | $$\left(2,1\right)$$ |
| iii) axis of symmetry | $$x=2$$ | $$x=0$$ | $$x=-3$$ | $$x=2$$ |
| iv) domain | $$\left\{x|xϵR\right\}$$ | $$\left\{x|xϵR\right\}$$ | $$\left\{x|xϵR\right\}$$ | $$\left\{x|xϵR\right\}$$ |
|  range | $$\left\{y|y\geq -5,yϵR\right\}$$ | $$\left\{y|y\leq 3,yϵR\right\}$$ | $$\left\{y|y\leq 0,yϵR\right\}$$ | $$\left\{y|y\geq 1,yϵR\right\}$$ |
| 2. Graphs |  |  |  |  |

3. $y=-\frac{1}{3}\left(x+1\right)^{2}+3$ 4. $y=3\left(x-5\right)^{2}-4$

5. a) $y=3\left(x-1\right)^{2}-4$ b) $y=\frac{1}{4}\left(x-2\right)^{2}-3$ c) $y=-\frac{1}{2}\left(x+3\right)^{2}-1$

 d) $y=\frac{3}{4}\left(x+3\right)^{2}-5$ e) $y=-\frac{1}{3}\left(x+3\right)^{2}+4$ f) $y=-\frac{1}{4}\left(x-4\right)^{2}+6$

g) $y=\frac{1}{3}\left(x+3\right)^{2}+2$ h) $y=-5\left(x+1\right)^{2}+8$ i) $y=\left(x-3\right)^{2}-4$

j) $y=-\frac{3}{2}\left(x-3\right)^{2}-2$

6. $y=\frac{4}{27}x^{2}$ 7. 4 8. $-11$

9. $x=-1; This is halfway between the x-intercepts$

10. $x=-3$ 11. $y=-\frac{1}{2}x^{2}+3$

12. a) 10m b) 20m c) 40m d) 7.5m

 e) No; the player would need to be able to reach 5.1m, which is impossible

 f) $h\left(d\right)=-0.25d^{2}$