PreCalculus UNIT C

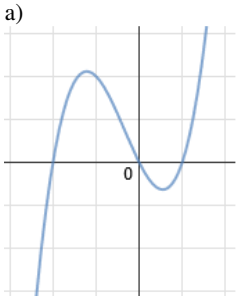
QUADRATICS – journal questions – MPM

Summarize everything you need to know about these topics. Use examples and concise (not long – but with enough detail) explanations. Include definitions and diagrams if necessary

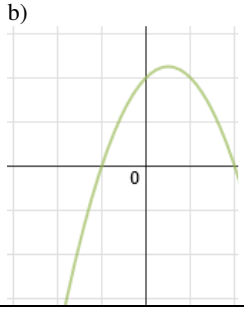
1. QUADRATIC RELATIONS

Given a **GRAPH**, how does one determine if it is quadratic or not? Classify the following using your answer

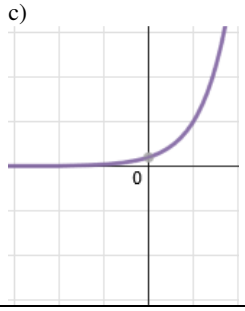
a)



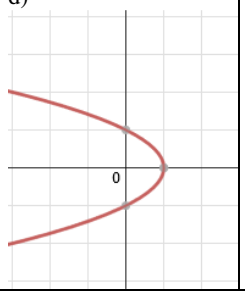
b)



c)



d)



Given a **TABLE**, how does one determine if it is quadratic or not? Classify the following using your answer

e)

x	y
-4	12
-3	6
-2	2
0	0
2	6
4	20

f)

X	Y
-4	1
-2	2
0	3
2	4
4	5

Given an **EQUATION**, how does one determine if it is quadratic or not? Classify the following using your answer

g) $y = 3x^2 - 9$

h) $y = 5^2 x$

i) $y = 0.3(5)^x$

j) $y = -x^2 + x + 2$

k) $y = x(x+2)$

l) $y = \frac{1}{x^2}$

m) Give definitions for Quadratics (and use pictures when possible) for each of the following: Parabola, Y-intercept, Zeros (include pictures where there is only ONE zero, TWO zeros and NO zeros for parabolas), Axis of Symmetry, Optimal Value (max/min), Vertex, Direction of Opening

2. TRANSFORMATIONS

a) Summarize how the constants (a, h, k) control transformations in the form $y = a(x-h)^2 + k$

b) State transformations of $y = x^2$ into $y = -\frac{1}{2}(x+4)^2 + 8$.

c) Sketch the basic parabola $y = x^2$ and then show a sketch of the transformed version $y = -\frac{1}{2}(x+4)^2 + 8$. Talk about how to find the image points from basic to the transformed version.

3. DIFFERENT FORMS of QUADRATICS

Given the following equations for quadratics, name each form and explain what each part represents.

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

b) $y = a(x-r)(x-t)$

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

Use the examples given for a detailed discussion of how one can adjust the equation to exactly match one of the 3 forms in order to find the key characteristics one can pull out from each form.

d) $y = 7x - 2x^2 + 3$

e) $y = (2x+1)(5-x)$

f) $y = -(2x+6)^2 - 7$

g) $y = 6x^2 + 5$ show how this can be 2 of the 3 forms

h) $y = -(x+4)^2$ show how this can be 2 of the 3 forms

4. FIND EQUATIONS if you are

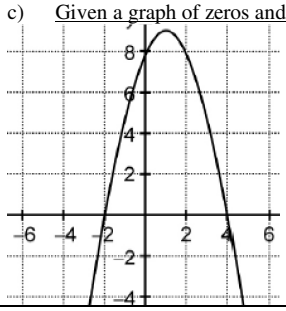
a) Given Transformations

The $y=x^2$ is reflected in the x-axis, vertically compressed (create your own number), shifted left by 7 and down by 4

b) Given Vertex and a Point

Vertex is (4, -5) and point (-3, 9)

c) Given a graph of zeros and a pt



d) Given a table with y-int

x	0	1	2	3	4	5
y	−2	15	26	31	30	23

5. GRAPHING QUADRATICS

Illustrate how to sketch parabolas if the following info is given:

a) $y=-0.5(x+5)^2+3$
Discuss the step by step transformations method. Discuss the order of applying these transformations

b) $y=-0.5(x+5)^2+3$
Discuss the shortcut method of "step pattern"

c) $y=-3(2-x)(x+5)$
Explain how to find vertex from zeros from this form

d) Zero is (2, 0) and vertex is (-3, 5)
Talk about how to make sure the parabola is symmetrical in your sketch

6. SOLVING QUADRATICS

a) Solving by factoring
$6x^2+6x=x+4$

b) Solving by completing the square
$3x^2=12x-1$

c) Solving by Quadratic Formula
$x^2-x=1$

7. NUMBER OF ZEROS

Find the number of zeros (no need to find zeros themselves, just discuss how many there will be)

a) <u>From Standard Form</u>
using Discriminant (define this)
$y=4x^2-4x+1$, $y=40+5x^2-30x$, $y=x^2+2x+3$

b) <u>From Vertex Form</u>
using the sign of 'a' and 'k'
$y=-5x^2-6$, $y=2(x+1)^2-7$, $y=-3(x+6)^2$

c) Discuss how an equation that doesn't factor over rational numbers can still have zeros and can be recorded in factored from after using the quadratic formula.
$y=2x^2+x-2$

8. WORD PROBLEMS with EQUATIONS given

In word problems the x and y variables may be replaced with different letters. For each of the following, interpret what the vertex, zeros and y-intercept could mean in real life scenario

a) $P=-n^2+120n-3500$ Where P is profit in hundreds for n thousand items sold.
vertex is $(60,100)$

zeros are (50,0) and (70,0)

y-intercept is (0,-3500)

b) $h=5t^2-30t+40$ Where h is height of a fish in relation to the surface of water in aquarium in centimeters at t seconds.
vertex is $(3,-5)$

zeros are (2,0) and (4,0)

y-intercept is (0,40)

c) For word problems, what word(s) give away that you must find the:
- The vertex (distinguish between the y part of the vertex and the x part of the vertex)
- The y-intercept
- The zeros

d) A model rocket is launched from the deck and the path followed by the rocket can be modelled by the relation $h = -5t^2 + 100t + 15$, where h, in metres, is the height that the model rocket reaches after t seconds.
- i) What is the initial height of the rocket?
- ii) What is the height of the model rocket after 2 s?
- iii) What is the maximum height reached by the model rocket?
- iv) When was the rocket **at** a height of 200m?
- v) How long was the model rocket **above** 200 m?
- vi) When did the rocket land on the ground?

9. WORD PROBLEMS without EQUATIONS given

a) <u>Revenue problem</u>
2000 tickets are sold at $35 each. If increase the price by $3, then 40 fewer tickets will be sold. What is the price that will maximize revenue? Set up equation then describe a method of solving, no need to solve.

b) <u>Fence/Rope off problem</u>
1800 m of rope is used to mark off perimeter of all sides of a rectangle and also to cut the rectangle in half. Find the dimensions to make the area of the whole rectangle maximum. Set up equation then describe a method of solving, no need to solve.

c) <u>Frame/border problem</u>
A picture, 100 by 50 cm, will have a border of x all around it. The area of the border is the same as the area of the picture (so total area is twice the area of the picture). Find the border length. Set up equation then describe a method of solving, no need to solve.

d) <u>Falling object problem</u>
A rocket is launched from 20m high, with initial speed of 120m/sec. Find the time when the rocket is at 35m high, and is on the way down. Set up equation then describe a method of solving, no need to solve.