

## 1 Quadratic Functions

**Vertex Form:**  $y = a(x - h)^2 + k$  , V(h,k)

**Standard Form:**  $y = ax^2 + bx + c$  , (0, c) = y-int

**Factored Form:**  $y = a(x - s)(x - t)$  , (s,0),(t,0) = x-ints

**First differences** - if the first diffs are the same, the function is linear

**Second differences** - if the second diffs are the same, the function is quadratic

## 2 Properties of Quadratics

### Complete the Square

1. Factor a out of the first two terms
2. Take the coefficient of the second term, divide by 2 and square it
3. Take the answer from 2. and add/sub inside the brackets
4. Factor the trinomial, move the negative outside and simplify

### Changing Form

factored to standard : expand

standard to factored : factor it

vertex to standard : expand

standard to vertex : complete the square

### Terminology

(R) Revenue - total amount of income ( $R = pQ$ )

(C) Cost - cost to produce items sold

(p) price - how much you sell it for

(P) Profit - amount made after costs deducted ( $P = R - C$ )

(Q) Quantity - how many sold (usually x)

## 3 Inverse of a Quadratic

### Inverting Functions

- 1) Given a graph: Select key points, flip the coordinates, regraph OR reflection over  $y = x$

2) Given an equation: let  $y = \dots$  (remove func notation), switch x and y variables, solve for y, go back to function notation

\*\*\* To restrict, set x to be greater than the axis of symmetry

## 4 Radicals

**Radical** - a square, cube, or higher root ( $\sqrt{\quad}$  - called the radical symbol)

### Properties

1.  $\sqrt{a}\sqrt{b} = \sqrt{ab}$
2.  $a\sqrt{b} + c\sqrt{d} = ac\sqrt{bd}$
3.  $a\sqrt{b} + c\sqrt{b} = (a + c)\sqrt{b}$
4.  $\sqrt{a}\sqrt{a} = a$
5.  $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

## 5 Solving Quadratic Equations

### 3.5 and 3.6

#### The Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

#### The Discriminant

$$D = b^2 - 4ac$$

If D is positive - 2 real roots

If D is zero - 1 real root

If D is negative - no real roots

If D is perfect square - factorable

## 6 Families of Quadratics

Quadratics that share a common property.

## 7 Linear Quadratic Systems

The intersection of a line and a parabola

**Secant** - 2 solutions

**Tangent** - 1 solution

Question wording: a) Find the POI (use sub/elim)

b) If there is only one POI then what is... (solve this by setting  $D$  to 0)

## 8 WORD PROBLEMS (extra section)

<https://dnsva.github.io/REVIEWS/MATH/math.html>