

SECTION 4.6 - GRAPHING QUADRATICS

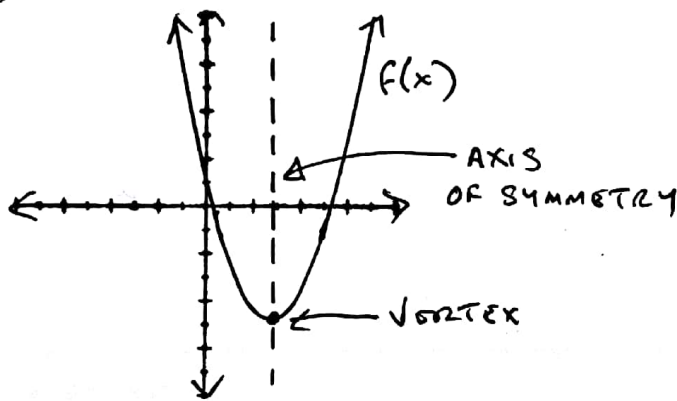
NAME:

\* QUADRATIC FUNCTIONS ARE NONLINEAR AND CAN BE WRITTEN IN THE FORM:

$$f(x) =$$

THIS FORM IS REFERRED TO AS \_\_\_\_\_.

THE SHAPE OF THE GRAPH OF A QUADRATIC FUNCTION IS CALLED A \_\_\_\_\_. PARABOLAS ARE SYMMETRIC ABOUT A CENTRAL LINE CALLED THE \_\_\_\_\_. THE AXIS OF SYMMETRY INTERSECTS THE GRAPH AT ONLY ONE POINT, CALLED THE \_\_\_\_\_.



PARENT FUNCTION:  $f(x) = x^2$

STANDARD FORM:

$$f(x) = ax^2 + bx + c$$

TYPE OF GRAPH: PARABOLA

AXIS OF SYMMETRY;  $x = \frac{-b}{2a}$

Y-INTERCEPT: c

\* OPEN UP OR OPEN DOWN?

WHEN  $a > 0$ , THE PARABOLA \_\_\_\_\_ AND THE VERTEX IS A \_\_\_\_\_.

WHEN  $a < 0$ , THE PARABOLA \_\_\_\_\_ AND THE VERTEX IS A \_\_\_\_\_.

EXAMPLE 1.

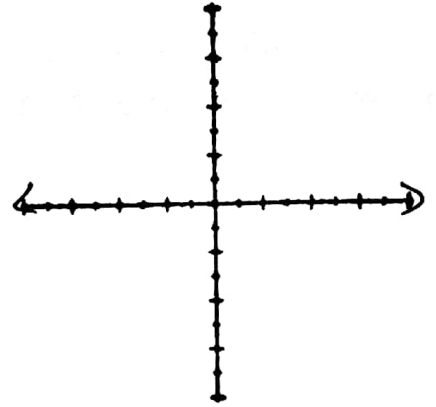
(A)  $f(x) = -2x^2 + x - 1$

(B)  $g(x) = 3x^2 - 5x + 2$

## \* GRAPHING QUADRATIC FUNCTIONS

$$P(x) = x^2 - 2x + 2$$

- ① DECIDE IF PARABOLA OPENS UP OR DOWN.
- ② FIND Y-INTERCEPT.
- ③ FIND THE EQUATION OF THE AXIS OF SYMMETRY.
- ④ FIND THE VERTEX.
- ⑤ MAKE A T-CHART TO HELP GRAPH.



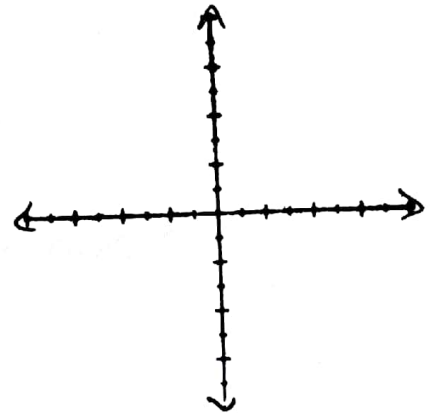
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### APPLICATION 1

① GIVEN  $f(x) = x^2 - 4x + 2$ ,

- Ⓐ UP OR DOWN?
- Ⓑ Y-INTERCEPT?
- Ⓒ EQUATION OF AOS?
- Ⓓ VERTEX?
- Ⓔ T-CHART.

Ⓕ GRAPH



②

2) GIVEN  $g(x) = x^2 + 6x + 8$

5) GRAPH!

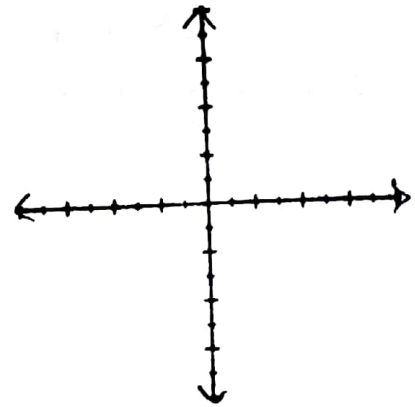
(A) UP OR DOWN?

(B) Y-INTERCEPT?

(C) EQUATION OF AOS?

(D) VERTEX?

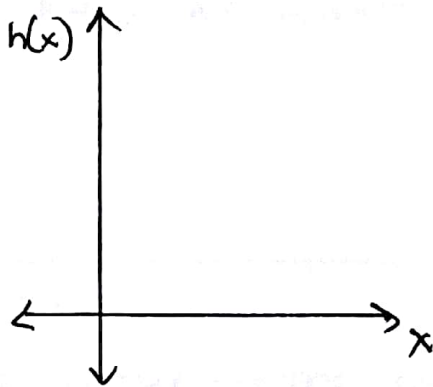
(E) T-CHART.



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EXAMPLE 2. THE CHARLESTONERS OF N. MIDDLESEX H.S. LAUNCH T-SHIRTS INTO THE CROWD EVERY TIME THE TEAM SCORES A TOUCHDOWN. THE HEIGHT OF A T-SHIRT CAN BE MODELED BY THE FUNCTION  $h(x) = -16x^2 + 48x + 6$ , WHERE  $h(x)$  REPRESENTS THE HEIGHT IN FEET OF THE T-SHIRT AFTER  $x$  SECONDS.

(A) GRAPH THE FUNCTION



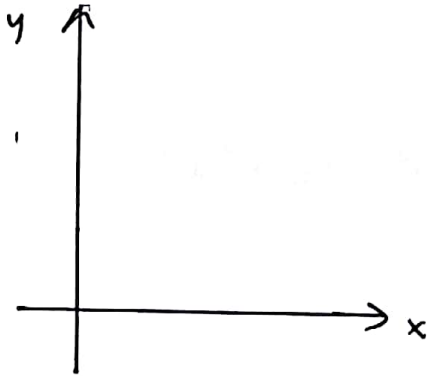
(B) AT WHAT HEIGHT WAS THE T-SHIRT LAUNCHED?

(C) WHAT IS THE MAXIMUM HEIGHT OF THE T-SHIRT AND AT WHAT TIME WAS IT REACHED?

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APPLICATION 2. EMELIO IS COMPETING IN THE JAVELIN THROW. THE HEIGHT OF THE JAVELIN CAN BE MODELED BY THE EQUATION  $y = -16x^2 + 64x + 6$ , WHERE  $y$  REPRESENTS THE HEIGHT IN FEET OF THE JAVELIN AFTER  $x$  SECONDS.

(A) GRAPH THE PATH OF THE JAVELIN.



(B) AT WHAT HEIGHT IS THE JAVELIN THROWN?

(C) WHAT IS THE MAXIMUM HEIGHT OF THE JAVELIN AND AT WHAT TIME WAS IT REACHED?

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PRACTICE!

(1) FIND THE VERTEX, EQUATION OF THE AXIS OF SYMMETRY, AND THE  $y$ -INTERCEPT OF THE GRAPH OF EACH FUNCTION.

(A)  $y = -3x^2 + 6x - 1$

(B)  $y = -x^2 + 2x + 1$

(C)  $y = x^2 - 4x + 5$

(D)  $y = 4x^2 - 8x + 9$

(4)

② FOR EACH FUNCTION, DETERMINE IF IT HAS A MAXIMUM OR A MINIMUM, STATE THE MAXIMUM OR MINIMUM VALUE, STATE THE DOMAIN + RANGE.

Ⓐ  $y = -x^2 + 4x - 3$

Ⓑ  $y = -x^2 - 2x + 2$

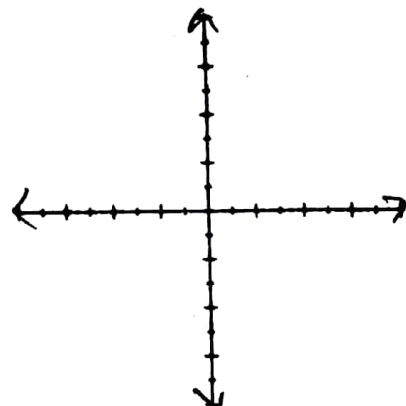
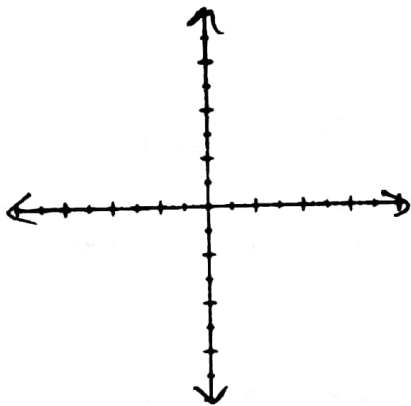
Ⓒ  $y = 3x^2 + 6x + 3$

Ⓓ  $y = 2x^2 + 8x - 6$

③ GRAPH EACH FUNCTION. CLEARLY LABEL: Ⓐ AOS, Ⓑ VERTEX.

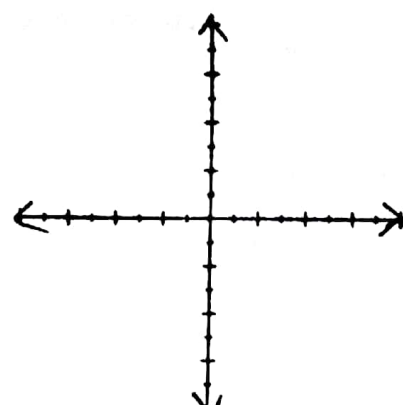
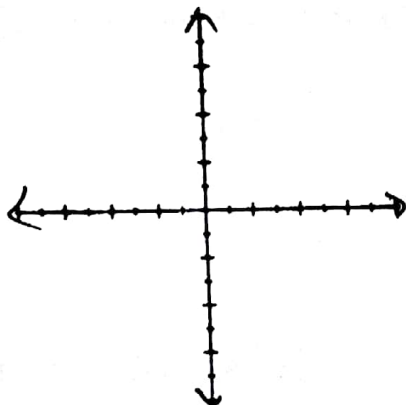
Ⓐ  $f(x) = -3x^2 + 6x + 3$

Ⓑ  $f(x) = -2x^2 + 4x + 1$



Ⓒ  $f(x) = 2x^2 - 8x - 4$

Ⓓ  $f(x) = 3x^2 - 6x - 1$



4) A FOOTBALL IS KICKED UP FROM THE GROUND LEVEL AT AN INITIAL UPWARD VELOCITY OF 90 FEET PER SECOND. THE EQUATION  $h = -16t^2 + 90t$  GIVES THE HEIGHT AFTER  $t$  SECONDS.

(A) WHAT IS THE HEIGHT OF THE BALL AFTER 1 SECOND?

(B) WHEN IS THE BALL 126 FEET HIGH?

(C) WHEN IS THE HEIGHT OF THE BALL 0 FEET?

(D) HOW HIGH DOES THE BALL GO?

5) LET  $f(x) = x^2 - 9$ .

(A) WHAT IS THE DOMAIN OF  $f(x)$ ?

(B) WHAT IS THE RANGE OF  $f(x)$ ?

(C) FOR WHAT VALUES IS  $f(x)$  NEGATIVE?

(HINT: GRAPH  $f(x)$ )

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