This should be completed without the use of a calculator unless otherwise specified.

**1.** Factor the following Quadratic Expressions:

A) $x^2 + 7x + 10$     10

$\boxed{(x+5)(x+2)}$   5  2 /  -7

B) $7x^2 + 15x + 2$    14

$\boxed{(7x+1)(x+2)}$   7  1 / 2 >14 \ 1     15

C) $6x^3 - 16x^2 + 21x - 5$

$2x^2(3x-8) + 1(21x-5)$

$\boxed{\text{PRime}}$

D) $x^2 - 49$

$\boxed{(x+7)(x-7)}$

2. The height that the soccer ball traveled is described by the following quadratic function. The soccer ball traveled by the path: $f(x) = -16x^2 + 40x + 2$. **(Calculator Allowed)**     $V: (1.25, 27)$

a) How high did the ball reach?  $\boxed{27 \text{ units}}$     $\boxed{2nd}$ $\boxed{\text{Trace}}$ $\boxed{4 \cdot \text{max}}$

b) At what time did the ball reach the maximum height?  $\boxed{1.25 \text{ units}}$

c) At what time does the ball hit the ground?  $\boxed{2.5 \text{ units}}$   $\boxed{2nd}$ $\boxed{\text{Trace}}$ $\boxed{2 \cdot \text{zero}}$

d) What was the height of the ball after .5 seconds?  $\boxed{18 \text{ units}}$   $\boxed{2nd}$ $\boxed{\text{Trace}}$ $\boxed{1 \cdot \text{value}}$

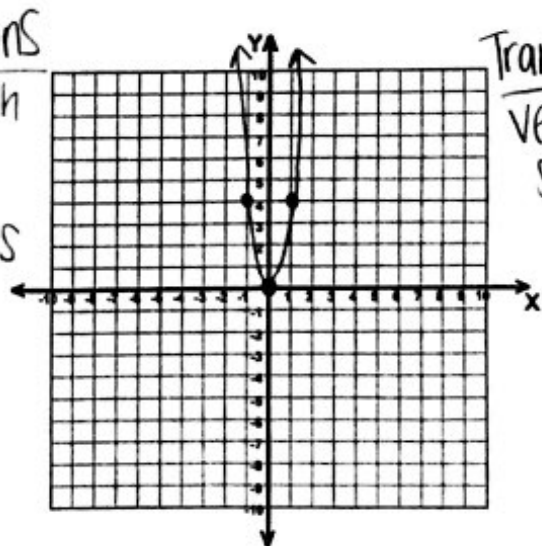e) How long is the soccer ball higher than 20 ft?     $0.6 - 1.9$   $\boxed{1.3 \text{ units}}$

**3.** Describe the transformation(s) from the parent function $y = x^2$ for each of the following and sketch the graph.

a) $y = 3(x-4)^2 + 2$     Vertex: $(4,2)$

b) $y = 4x^2$
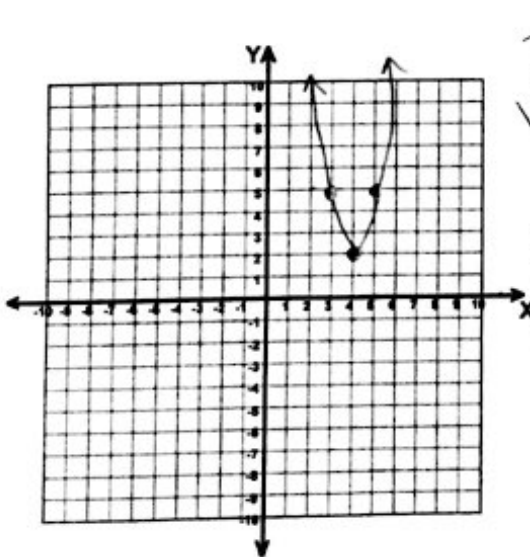


Transformations
Vertical Stretch
of 3
Right 4 units
up 2 units



Transformations
Vertical
Stretch of
4

4) Given the following transformations to the parent function, $y = x^2$, write the equation:

Vertical Stretch by a factor of 3, left 4, down 7.   $\boxed{y = 3(x+4)^2 - 7}$

## 5) Convert the following functions

a. Standard form to Vertex Form: $y = 2x^2 - 16x + 35$

vertex: $\dfrac{-b}{2a} = \dfrac{16}{2(2)} = \dfrac{16}{4} = 4$

$(4, 3)$

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

b. Vertex form to Standard Form: $y = (2x-4)^2$

$y = 4x^2 - 8x - 8x + 16$

$\boxed{y = 4x^2 - 16x + 16}$

## 6) Find the following for the function: $y = -12 - 2x + 2x^2 \rightarrow 2x^2 - 2x - 12$
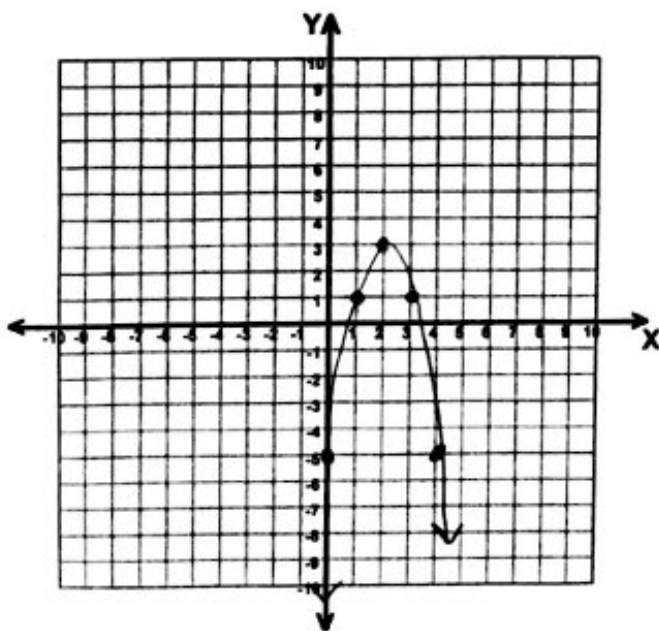
a) Vertex $h = \dfrac{-b}{2a} = \dfrac{2}{2(2)} = \dfrac{1}{2}$

$\boxed{(\frac{1}{2}, -12.5)}$

$y = 2(x - \frac{1}{2})^2 - 12.5$

b) y-intercept

$\boxed{(0, -12)}$

c) Axis of symmetry

$\boxed{X = 0}$

## 7) Sketch the graph of the following function $y = -2(x-2)^2 + 3$



a) State the vertex $\boxed{(2, 3)}$

b) Find the y-intercept.

$\boxed{(0, -5)}$

c) Find the axis of symmetry

$\boxed{X = 0}$

d) State the transformations from the parent function $y = x^2$

reflect over x-axis
vertical stretch by 2
right 2 units
up 3 units

**8) Perform the following Polynomial Operations. Write your answer in Standard Form.**
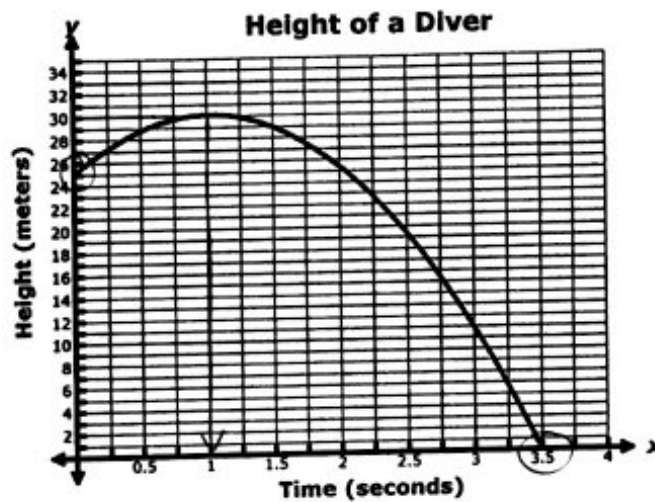
a) $(x+5)^2 - 8$

$x^2 + 10x + 25 - 8$

$$\boxed{x^2 + 10x + 17}$$

b) $(3 + 5x + x^4) - (3x^4 + 4x - 5)$

$$\boxed{-2x^4 + x + 8}$$

**9) This graph represents the height of a diver vs. the time after the diver jumps from a springboard. Answer the following questions based on the information.**



Height of a Diver

Height (meters) vs. Time (seconds)

a) After how many seconds did the diver reach his maximum height? $\boxed{1 \text{ second}}$

b) What is the maximum height that the diver reached? $\boxed{30 \text{ meters}}$

c) After how many seconds did the diver land in the water? $\boxed{3.5 \text{ seconds}}$
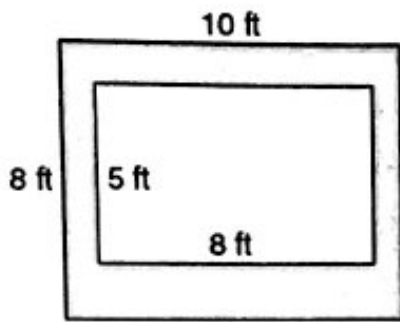
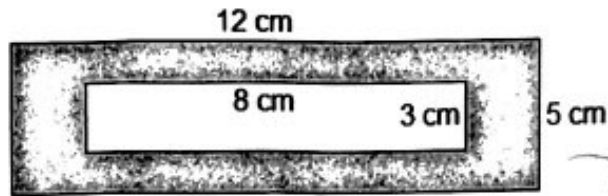d) What is the y-intercept of the graph? $\boxed{(0, 25)}$

e) What does the y-intercept represent in the context of this situation?

starting height of springboard

( v

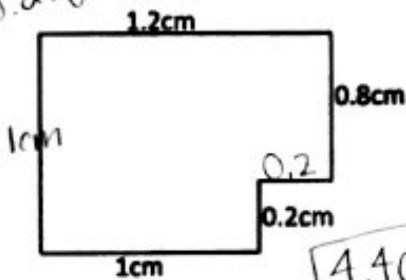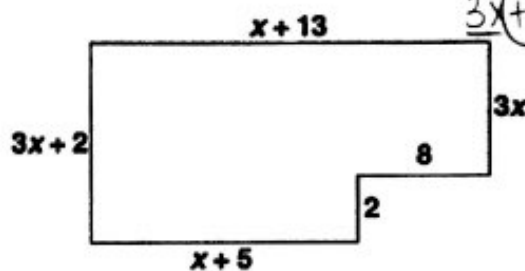**10) Find the area of the shaded region for each of the figures below.**

10 ft

8 ft | 5 ft

8 ft

$A = (10(8)) - (5(8)) = \boxed{40 ft^2}$

12 cm

8 cm    3 cm    5 cm

$A = (12(5)) - (8(3))$

$\boxed{36 cm^2}$

**11) Find the perimeter of the following polygons:**

$1.2 + 1 + 0.8 + 0.2 + 0.2 + 1 =$

1.2cm

1cm

0.8cm

0.2

0.2cm

1cm

$\boxed{4.4 cm}$

$x + 13$

$3x + 2$

8

2

$x + 5$

$3x$

$3x + 2 + x + 13 + 3x + 8 + 2 + x + 5$

$\boxed{8x + 30}$

**12) The following table give the average cost, to the nearest hundred, of a new 4-door sedan.**

| | Year | Value |
|---|------|-------|
| 1 | 1991 | $12,800 |
| 4 | 1994 | $15,500 |
| 7 | 1997 | $19,200 |
| 10 | 2000 | $24,300 |
| 13 | 2003 | $30,100 |

(Calculator Allowed)

a.  Use this information to construct a quadratic regression to represent the model, rounding all constants to 3 decimal places.

$x = yr$ since 1990 → or   $x = yr$

$y = 60.317x^2 - 239461.270x + 237676875.6$

$y = 60.317x^2 + 602.222x + 12123.175$

b.  Using this regression model, estimate during which year the average cost of a new 4-door sedan reached 37,000.   $x = 16 \rightarrow 37,200$

$1990 + 15 = \boxed{2005}$

c.  Using the regression model, find the value of a new 4-door sedan in 2016.

$x = 26$

$\boxed{\$68555.24}$