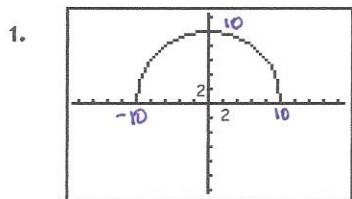
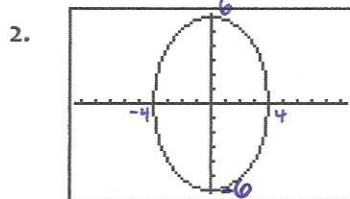


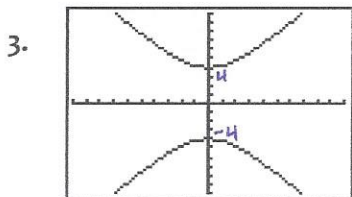
1-4: Determine whether each graph is a function. State the domain and range using set builder notation.



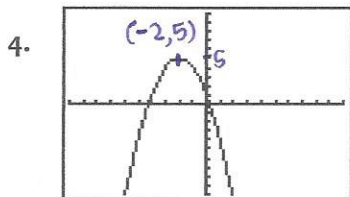
Function? Yes No
D: $-10 \leq x \leq 10$
R: $0 \leq y \leq 10$



Function? Yes No
D: $-4 \leq x \leq 4$
R: $-6 \leq y \leq 6$

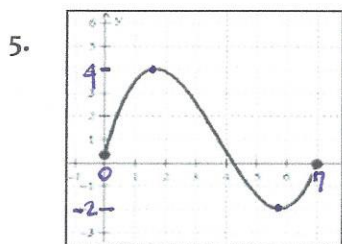


Function? Yes No
D: \mathbb{R}
R: $y \leq -4$ or $y \geq 4$

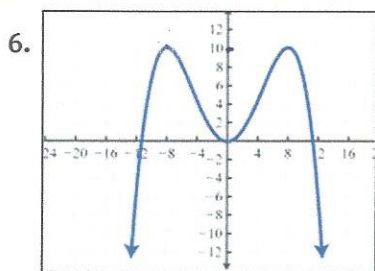


Function? Yes No
D: \mathbb{R}
R: $(-\infty, 5]$

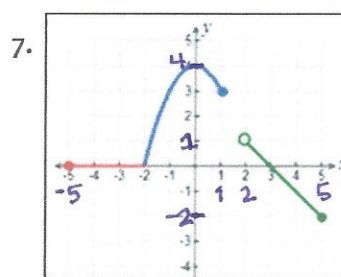
5-7: Write the domain and range each function using interval notation.



D: $[0, 7]$
R: $[-2, 4]$



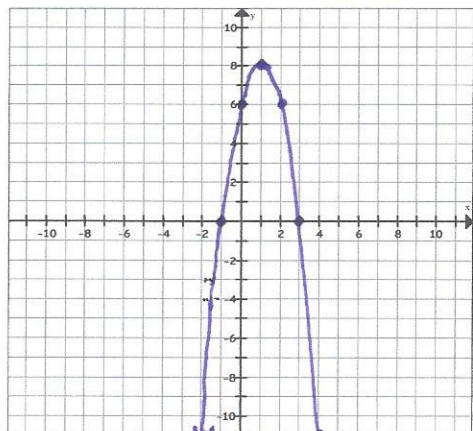
D: $(-\infty, \infty)$
R: $(-\infty, 10]$



D: $[-2, 1] \cup (2, 5]$
R: $[-2, 4]$

8-10: Graph each function and fill in the blanks. Write the domain and range using interval notation.

8. $y = ax^2 + bx + c$
 $y = -2x^2 + 4x + 6$
 $a = -2$
 $b = 4$
 $c = 6$



$a = -2$
 $1a = -2$
 $3a = -6$
 $5a = -10$
etc...

vertex: $(1, 8)$ Is it a maximum or minimum? Circle one.
 $x = \frac{-b}{2a} = \frac{-4}{2(-2)} = 1$
 $y = -2(1)^2 + 4(1) + 6 = 8$
 $y = -2 + 4 + 6 \rightarrow y = 8$

Equation in vertex form: $y = a(x-h)^2 + k$
 $y = -2(x-1)^2 + 8$

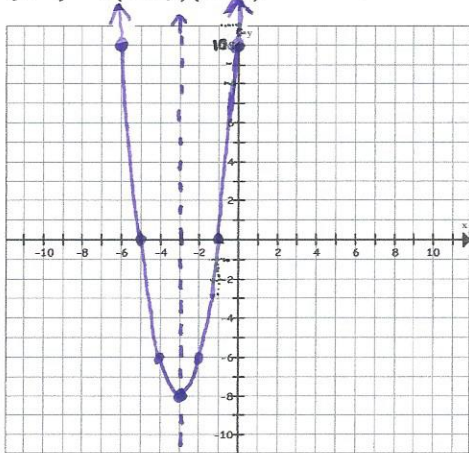
y-intercept: $(0, 6)$ axis of symmetry: $x = 1$

domain: $(-\infty, \infty)$ range: $(-\infty, 8]$

roots/zeros: $\{-1, 3\}$

Equation in intercept form: $y = a(x-p)(x-q)$
 $y = -2(x+1)(x-3)$

9. $y = 2(x+5)(x+1)$



$a = 2$
 $1a = 2$
 $3a = 6$
 $5a = 10, \text{ etc...}$

vertex: $(-3, -8)$

$y = 2(-3+5)(-3+1)$
 $y = 2(2)(-2) = -8$

Is it a maximum or minimum?

Circle one. $a > 0$

Equation in vertex form: $y = 2(x+3)^2 - 8$

y-intercept: $(0, 10)$ axis of symmetry: $x = -3$

domain: $(-\infty, \infty)$ range: $[-8, \infty)$

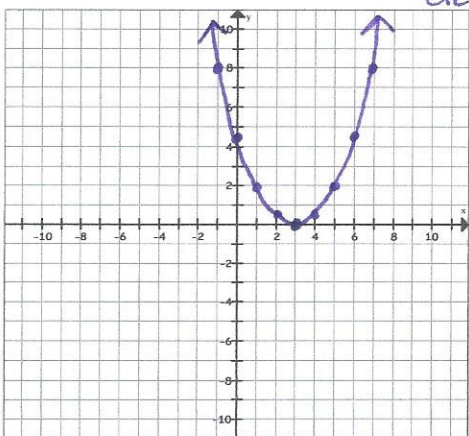
roots/zeros: $\{-5, -1\}$

Equation in general form: $y = 2x^2 + 12x + 10$

$y = ax^2 + bx + c$

$y = 2(x+5)(x+1)$
 $y = 2(x^2 + 6x + 5)$
 $y = 2x^2 + 12x + 10$

10. $y = \frac{1}{2}(x-3)^2$



$a = \frac{1}{2} \Rightarrow 1a = 0.5$
 $3a = 1.5$
 $5a = 2.5$
 $7a = 3.5$
 etc...

vertex: $(3, 0)$

Is it a maximum or minimum?

Circle one. $a > 0$

y-intercept: $(0, \frac{9}{2})$

$y = \frac{1}{2}(0-3)^2 = \frac{1}{2}(9) = \frac{9}{2} = 4.5$

axis of symmetry: $x = 3$

domain: $(-\infty, \infty)$ range: $[0, \infty)$

roots/zeros: $3, \text{ double root}$

Equation in intercept form: $y = \frac{1}{2}(x-3)(x-3) \Rightarrow y = \frac{1}{2}(x-3)^2$

Equation in general form: $y = \frac{1}{2}x^2 - 3x + \frac{9}{2}$

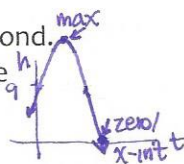
$y = ax^2 + bx + c$

$y = \frac{1}{2}(x-3)(x-3)$
 $y = \frac{1}{2}(x^2 - 6x + 9)$
 $y = \frac{1}{2}x^2 - 3x + \frac{9}{2}$

11-13: Draw an appropriate sketch and use a calculator to find each solution.

Round decimal answers to the nearest hundredth.

11. An object is released into the air at an initial height of 9 feet and an initial velocity of 30 feet per second. The object is caught at a height of 10 feet. Use the vertical motion model, $h = -16t^2 + v_0 t + h_0$, where h is the height, t is the time in motion, h_0 is the initial height, and v_0 is the initial velocity.



a. Write the equation for the model of this function.

$h = -16t^2 + 30t + 9$ ← (Do not put the value $h = 10$ into function yet... Use this version of the function to graph on a calculator.)

b. How long the object is in motion?

$y_1 = -16x^2 + 30x + 9$
 $y_2 = 10$
 find point of intersection
 $(1.841052, 0)$

OR

$10 = -16t^2 + 30t + 9$
 $0 = -16t^2 + 30t - 1$
 $y_1 = -16x^2 + 30x - 1$
 find x-intercept/zero
 $(1.841052, 0)$
 t
 1.84 seconds

c. What was the maximum height of the object? vertex: $(0.93749806, 23.0625)$

23.06 feet

d. If the ball wasn't caught in the air, how long would it take for it to hit the ground? $y_1 = -16x^2 + 30x + 9$
 find zero/x-intercept
 $(2.1380858, 0)$
 2.14 seconds

jump from a window 😊

12. Lauren is trapped in a building 120 feet above the ground and wants to land on a rescue team's air cushion. Lauren's height is modeled by $h = -16t^2 + h_0$, where t is time and h_0 is initial height.

a. How long before Lauren reaches safety? $y = -16x^2 + 120$ find zero / x-intercept (time)
 $(2.7386128, 0)$

2.74 seconds

b. What was the highest Lauren jumped before she landed on the air cushion?

find max/vertex (time, height)
 $(0, 120)$

120 feet

13. A study compared the speed x (in miles per hour) and the average fuel economy y (in miles per gallon) for cars. The results are shown in the table.

L1	Speed, x	15	20	25	30	35	40	45	50	55	60	65	70
L2	Fuel economy, y	22.3	25.5	27.5	29.0	28.8	30.0	29.9	30.2	30.4	28.8	27.4	25.3

a. Use a graphing calculator to view the scatterplot of the data. Then find the best-fitting quadratic model for the data and write it in the blank below rounded to the nearest thousandth.
 2nd > STAT PLOT > ZOOM 9: zoomStat
 T184 > STAT > CALC > 5: QuadReg

$$y = -0.008x^2 + 0.75x + 13.47$$

T183 > STAT > CALC > 5: QuadReg
 in home screen: QuadReg VARS > Y-vars > function > Y1
 (before enter)

x list: L1
 y list: L2
 Store RegEQ: vars > y-vars > function > Y1

b. Find the speed that maximizes a car's fuel economy.

find max/vertex: (speed, fuel economy)
 $(45.498782, 30.440676)$
 45.50

45.50 mph / 45 mph

c. Predict what the gas mileage would be if the speed was 63 miles per hour.

27.93 miles per gallon

2nd > TABLE
 @ X=63 Y=27.9300549451

14-19: Factor each polynomial completely. Circle your final solution.

14. $2x^2 + 14x - 36$

$$2(x^2 + 7x - 18)$$

$$2(x+9)(x-2)$$

15. $2x^2 - 3x - 5$

$$2x^2 + 2x - 5x - 5$$

$$2x(x+1) - 5(x+1)$$

$$(x+1)(2x-5)$$

$-\frac{1}{3} \quad -\frac{10}{25} \times$

16. $4z^2 + 4z - 15$

$$4z^2 - 6z + 10z - 15$$

$$2z(2z-3) + 5(2z-3)$$

$$(2z-3)(2z+5)$$

$+\frac{1}{4} \quad -\frac{60}{1, 60}$
 $2, 30$
 $3, 20$
 $4, 15$
 $5, 12$
 $-6z + 10z$

17. $16c^2 - 100$

$$4(4c^2 - 25)$$

$$4(2c+5)(2c-5)$$

18. $12x^2yz - 6xy^2z^2 + 3xyz$

$$3xyz(4x - 2yz + 1)$$

19. $4p^2 + 4p - 24$

$$4(p^2 + p - 6)$$

$$4(p+3)(p-2)$$

20-28: Solve each equation by factoring. Circle your final solution.

20. $3x^2 = 10 - 13x$

$3x^2 + 13x - 10 = 0$
 $3x^2 - 2x + 15x - 10 = 0$
 $x(3x-2) + 5(3x-2) = 0$
 factored form: $(3x-2)(x+5) = 0$
 $3x-2=0$ $x+5=0$
 $x = \frac{2}{3}, x = -5$

21. $x^2 + 12x + 36 = 4$

$x^2 + 12x + 32 = 0$
 $(x+8)(x+4) = 0$
 $x = -8, x = -4$

22. $6 = x^2 - x$

$x^2 - x - 6 = 0$
 $(x-3)(x+2) = 0$
 $x = 3, x = -2$

23. $4x^2 + 1 = 26$

$4x^2 - 25 = 0$
 $(2x+5)(2x-5) = 0$
 $x = -\frac{5}{2}, x = \frac{5}{2}$

24. $9x^2 + 30x + 25 = 0$ \otimes Perfect square TRINOMIAL

$(3x+5)(3x+5) = 0$
 $3x+5=0$
 $x = -\frac{5}{3}$, double root

25. $x^2 - 4x = 5$

$x^2 - 4x - 5 = 0$
 $(x-5)(x+1) = 0$
 $x = 5, x = -1$

26. $4x^2 - 20x = 0$

$4x(x-5) = 0$
 $x = 0, x = 5$

27. $2x^2 + 5x - 3 = 0$

$2x^2 - x + 6x - 3 = 0$
 $x(2x-1) + 3(2x-1) = 0$
 $(2x-1)(x+3) = 0$
 $x = \frac{1}{2}, x = -3$

28. $36x^2 = 25$

$36x^2 - 25 = 0$
 $(6x+5)(6x-5) = 0$
 $x = -\frac{5}{6}, x = \frac{5}{6}$

29-32: Write a quadratic function in general/standard form for the information given.

29. roots: $x = \left\{ \frac{1}{3}, -2 \right\}$

$x = \frac{1}{3}$ $x = -2$
 $(x - \frac{1}{3})(x + 2) = 0$
 $(3x - 1)(x + 2) = 0$
 $3x^2 + 5x - 2 = 0$

30. roots: $x = \left\{ -\frac{4}{5}, 1 \right\}$

$x = -\frac{4}{5}$ $x = 1$
 $(x + \frac{4}{5})(x - 1) = 0$
 $(5x + 4)(x - 1) = 0$
 $5x^2 - x - 4 = 0$

31. one root: $x = \{12\}$

$(x-12)(x-12) = 0$
 $x^2 - 24x + 144 = 0$

vertex form:
 $y = \frac{1}{36}(x-2)^2 - 1$
 $y = \frac{1}{36}(x-2)(x-2) - 1$
 $y = \frac{1}{36}(x^2 - 4x + 4) - 1$
 $y = \frac{1}{36}x^2 - \frac{1}{9}x + \frac{1}{9} - 1$

32. one of the two zeros is at -4, has a minimum output value of -1, and an axis of symmetry of $x = 2$

x -coord. of vertex is 2.
 vertex (2, -1)
 $y = a(x-2)^2 - 1$
 $0 = a(-4-2)^2 - 1$
 $0 = 36a - 1$
 $1 = 36a$
 $a = \frac{1}{36}$
 $\Rightarrow y = \frac{1}{36}x^2 - \frac{1}{9}x + \frac{8}{9}$