

Chapter 10 Test study guide

Explain how the graph of each function below is different from the parent function: $y = x^2$

1. $y = -2x^2 + 2$

This is flipped over the x axis, it is more narrow and the vertex moves up 2 units.

2. $y = -x^2$

This is a reflection (or flip) of the parent function.

3. $y = 2x^2$

This is more narrow.

4. $y = 3x^2 - 4$

This is more narrow and the vertex moved down 4 units.

Write each equation in vertex form. Give the coordinates for the vertex and determine if that point is a maximum or minimum

5. $y = x^2 - 6x + 5$

$y = x^2 - 6x + 9 - 9 + 5$
 $y = (x - 3)^2 - 4$
vertex (3, -4)
minimum.

6. $y = x^2 + 5x - 12$

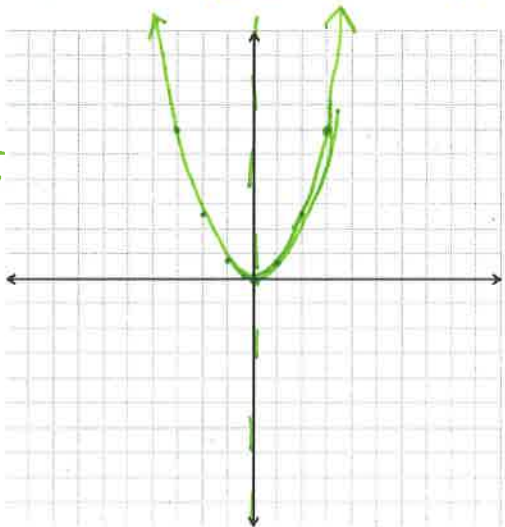
$y = x^2 + 2(2.5x) + 2.5^2 - 2.5^2 - 12$
 $y = (x + 2.5)^2 - 18.25$
or
 $y = (x + \frac{5}{2})^2 - \frac{73}{4}$
vertex: (-2.5, -18.25)
or (- $\frac{5}{2}$, - $\frac{73}{4}$)
Minimum

Graph each function. Place at least 3 points on each side of the axis of symmetry.

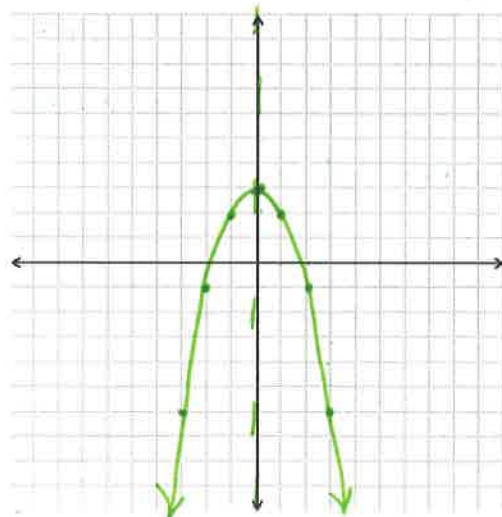
7. $y = \frac{2}{3}x^2$

Axis of symmetry $x = 0$

x	y
0	0
1	$\frac{2}{3} = 0.\bar{6}$
2	$\frac{8}{3} = 2.\bar{6}$
3	6



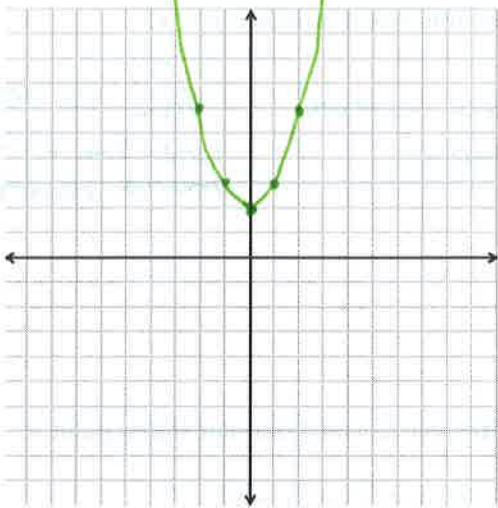
8. $y = -x^2 + 3$



x	y
0	3
1	2
2	-1
3	-6

Axis of Symmetry $x = 0$

9. $y = x^2 + 2$



Axis of Symmetry $x = 0$

x	y
0	2
1	3
2	6
3	11

Find the number of x-intercepts of each function.

11. $y = 8x^2$

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

$$d = 0^2 - 4 \cdot 8 \cdot 0$$

$$= 0^2 - 0$$

$$= 0$$

1 x-intercept

12. $y = 4x^2 + 9$

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

$$= 0^2 - 4 \cdot 4 \cdot 9$$

$$= -144$$

0 x-intercepts

13. $y = -3x^2 + x - 4$

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

$$= 1^2 - 4 \cdot (-3) \cdot (-4)$$

$$= 1 - 48$$

$$= -47$$

0 x-intercepts

14. $y = x^2 - 5x$

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

$$= (-5)^2 - 4 \cdot 1 \cdot 0$$

$$= 25 - 0$$

$$= 25$$

2 x-intercepts

Find the value of n such that each expression is a perfect square trinomial. (what would you add to each side to complete the square?)

15. $p^2 + 10p + n$

$n = 25$

$$\frac{10p}{2p} = 5$$

$$5^2 = 25$$

16. $y^2 - 60y + n$

$n = 900$

$$\frac{60y}{2y} = 30$$

$$30^2 = 900$$

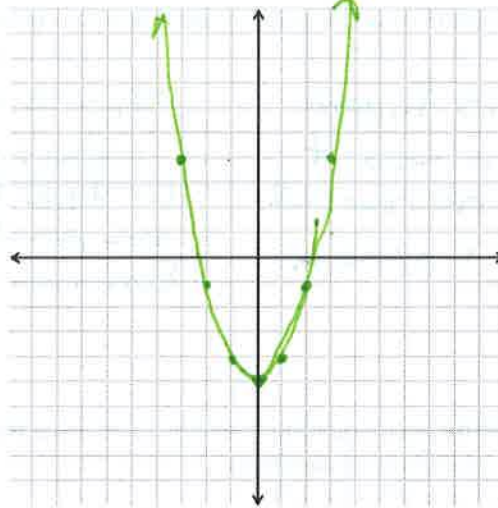
17. $x^2 - 14x + n$

$n = 49$

$$\frac{14x}{2x} = 7$$

$$7^2 = 49$$

10. $y = x^2 - 5$



Axis of Symmetry $x = 0$

x	y
0	-5
1	-4
2	-1
3	4

Solve each equation provide answers as whole numbers, simplified fractions, or simplified square roots.

18. $x^2 - 18x = 19$

$$x^2 - 18x + 81 = 19 + 81$$

$$(x-9)^2 = 100$$

$$x-9 = \pm 10$$

$$x = 19, -1$$

Check:

$$19^2 - 18 \cdot 19 = 19$$

$$361 - 342 = 19$$

$$19 = 19 \checkmark$$

$$(-1)^2 - 18(-1) = 19$$

$$1 + 18 = 19 \checkmark$$

19. $4a^2 + 8a - 20 = 0$

$$a = 4 \quad b = 8 \quad c = -20$$

$$a = \frac{-8 \pm \sqrt{64 - 4 \cdot 4 \cdot (-20)}}{2 \cdot 4}$$

$$a = \frac{-8 \pm \sqrt{64 + 320}}{8}$$

$$a = \frac{-8 \pm \sqrt{384}}{8}$$

$$a = \frac{-8 \pm 8\sqrt{6}}{8}$$

$$a = -1 \pm \sqrt{6}$$

20. $(x-5)(2x+1) = 0$

$$x = 5$$

$$2x+1=0$$

$$2x = -1$$

$$x = -\frac{1}{2}$$

$$x = -\frac{1}{2}, 5$$

21. $x^2 = 10x$

$$x^2 - 10x = 0$$

$$x(x-10) = 0$$

$$x = 0, 10$$

22. $x^2 - 7x = -12$

$$x^2 - 7x + 12 = 0$$

$$(x-3)(x-4) = 0$$

$$x = 4, 3$$

23. $3x^2 = 48$

$$\frac{3x^2}{3} = \frac{48}{3}$$

$$x^2 = 16$$

$$x = \pm 4$$

24. $2x^2 - 5x = 12$

$$2x^2 - 5x - 12 = 0$$

$$\frac{5 \pm \sqrt{5^2 - 4 \cdot 2 \cdot (-12)}}{2 \cdot 2}$$

$$\frac{5 \pm \sqrt{25 + 96}}{4}$$

$$x = 4, -1.5$$

$$\frac{5 \pm \sqrt{121}}{4}$$

$$\frac{5 \pm 11}{4}$$

25. $-x^2 + 6x - 4 = 0$

$$\frac{-6 \pm \sqrt{36 - 4 \cdot (-1) \cdot (-4)}}{2 \cdot (-1)}$$

$$\frac{-6 \pm \sqrt{36 - 16}}{-2}$$

$$\frac{-6 \pm \sqrt{20}}{-2}$$

$$\frac{-6 \pm 2\sqrt{5}}{-2} = 3 \pm \sqrt{5}$$

Model each problem with a quadratic equation. Then solve.

26. The volume of a square pyramid is given by the formula $V = \frac{1}{3}hx^2$, where h is the height of the pyramid and x is the length of one side of the base. A pyramid with a height of 15 ft has a volume of 2880 ft³. What is the length of one side of the base?

Equation: $V = \frac{1}{3} \cdot 15x^2$

$x = 24$ ft

$$V = 5x^2$$

$$\frac{2880}{5} = \frac{5x^2}{5}$$

$$576 = x^2$$

$$\sqrt{576} = x$$

27. The area of a soccer field is 5000 yd². The length of the field is twice the width. Find the dimensions of the field.

Equation: $A = 2w^2$

$w = 50$ $L = 100$



$$5000 = 2w^2$$

$$2500 = w^2$$

$$\sqrt{2500} = w$$

$$50 = w$$

Choose the best model for the table of values (exponential, quadratic or linear) and write an equation.

28:

x	y
2	20
3	68
4	260
5	1028
6	5000

Exponential
Common ratio: 3.9
 $20 = a \cdot 3.9^2$
 $a = 1.3$

$y = 1.3 \cdot 3.9^x$

d.f. 2nd d.f.
> +48 } 144
> +192 } 576
> +768 } 3,204
> 3972 } 3,204

Ratios:
 $\frac{68}{20} = 3.4$ $\frac{260}{68} = 3.8$ $\frac{1028}{260} = 3.9$
 $\frac{5000}{1028} = 4.8$

29:

x	y
1	-1
2	2
3	5
4	8
5	11

Linear

y intercept: $-1 - 3 = -4$
slope = 3

$y = 3x - 4$

30:

x	y
-1	-5
0	3
1	11
2	19
3	27

Linear

y intercept: 3
slope: 8

$y = 8x + 3$

31:

x	y
-1	-2
0	-1
1	4
2	13
3	26

1st d.f. 2nd d.f.

> +1 } +4
> +5 } +4
> +9 } +4
> +13 } +4

Quadratic

32:

x	y
3	28
4	34
5	40
6	46
7	52

Linear

slope = 6
 $y = mx + b$
 $28 = 6 \cdot 3 + b$
 $28 = 18 + b$
 $10 = b$

$y = 6x + 10$

33:

x	y
-3	-1
-2	1
-1	3
0	5
1	7

Linear

slope: 2
y-intercept: 5

$y = 2x + 5$

Exponential $y = 1.92 \cdot 2.7^x$

$y = ar^x$
 $y = a \cdot 2.7^x$
 $14 = a \cdot 2.7$
 $a = 1.92$

34:

x	y
2	14
3	32
4	86
5	248
6	734

1st diff.
 2nd diff.
 $+18$
 $+54$
 $+162$
 $+486$
 $+36$
 $+108$
 $+324$

35:

x	y
0	-2
1	3
2	33
3	213
4	1293

None

Ratios

$\frac{32}{14} = 2.28$ $\frac{86}{32} = 2.68$ $\frac{248}{86} = 2.88$
 $\frac{734}{248} = 2.96$ Average Common ratio: 2.7

36:

x	y
3	20
4	25
5	30
6	35
7	40

$+5$
 $+5$
 $+5$
 $+5$
 Slope: 5

37:

x	y
2	33
3	133
4	633
5	3133
6	15633

$\frac{133}{33} = 4.03$
 $\frac{633}{133} = 4.76$
 $\frac{3133}{633} = 4.95$
 $\frac{15633}{3133} = 4.99$

Linear

$20 = 5b + b$
 $20 = 15 + b$
 $5 = b$

$y = 5x + 5$

Average common ratio: 4.7

$y = ar^x$
 $y = a \cdot 4.7^x$
 $33 = a \cdot 4.7^2$
 $33 = a \cdot 22.09$

$1.5 = a$
 $y = 1.5 \cdot 4.7^x$