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CHAPTER 5 REVIEW

5.1 – EXPAND BINOMIALS

1. Expand and simplify the following. An example has been provided

(a) $(x + 2)(x + 4)$
$= x^2 + 4x + 2x + 8$
$= \mathbf{x^2 + 6x + 8}$

(b) $(x + 2)(x – 6)$

(c) $(x – 11)(x + 1)$

(d) $(x – 9)(x – 9)$

2. Expand and simplify. An example has been provided

(a) $(3x – 7)(2x + 1)$
$= 6x^2 + 3x – 14x – 7$
$= \mathbf{6x^2 – 11x – 7}$

(b) $(8x + 1)(2x – 5)$

(c) $(3x + 1)(5x – 3)$

(d) $(2x – 5)^2$

(e) $(10x + 3)^2$

3. Angela's vegetable garden has dimensions with a **length = (3x + 4)** and **width = (x + 6)**.

(a) Write an expression in for the area of garden and simplify

Area = Length x Width

(b) If **x = 10m**, calculate the actual area of Angela's garden

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5.2 – CHANGE QUADRATIC RELATIONS FROM VERTEX FORM TO STANDARD FORM

Vertex form: $\mathbf{y = a(x – h)^2 + k}$ Standard form: $\mathbf{y = ax^2 + bx + c}$

1. Expand and simplify each relation into *standard form*. An example has been provided

(a) $y = (x – 3)^2$
$y = x^2 – 3x – 3x + 9$
$\mathbf{y = x^2 – 6x + 9}$

(b) $y = (x + 2)^2$

(c) $y = (x + 6)^2$

2. Expand and simplify each relation into *standard form*

(a) $y = (x + 3)^2 – 1$

(b) $y = (x – 2)^2 + 5$

(c) $y = (x + 1)^2 – 4$

3. Expand and simplify each relation into *standard form*

(a) $y = 2(x + 3)^2$

(b) $y = – 3(x – 5)^2$

4. Expand and simplify each relation into *standard form*

(a) $y = 3(x – 2)^2 + 1$

(b) $y = – 2(x – 1)^2 + 4$

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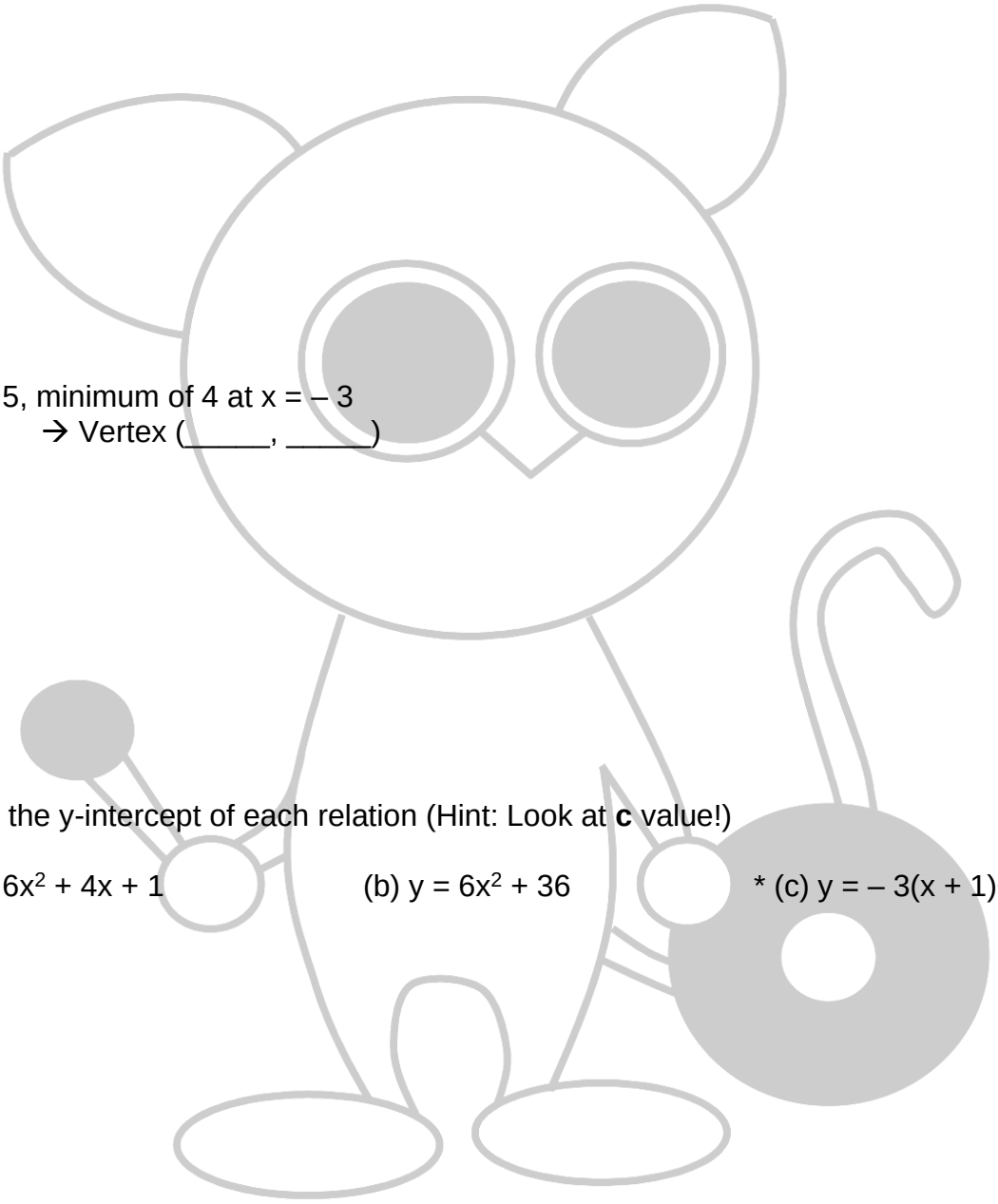
5. Write an equation in *standard form* for each quadratic relation

* Use the given information and substitute into the **vertex form** [$y = a(x - h)^2 + k$] first!

(a) a = – 3, vertex at (4, 3)

(b) a = 2, minimum of 5 at x = – 1
→ Vertex (____, ____)



(c) a = 5, minimum of 4 at x = – 3
→ Vertex (_____, _____)

6. Find the y-intercept of each relation (Hint: Look at **c** value!)

(a) $y = 6x^2 + 4x + 1$

(b) $y = 6x^2 + 36$

* (c) $y = – 3(x + 1)^2 + 5$

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7. A baseball was hit into the air. Its path can be modelled by the relation **$h = -2(t - 4)^2 + 33$**, where **t** represents the time in seconds and **h** represents the height in metres

(a) Expand and simplify the relation into *standard form*

(b) What is the **vertex** of the relation? _____. What does this represent in this situation?

5.3 – FACTOR TRINOMIALS IN THE FORM $x^2 + bx + c$

1. Factor each trinomial using the **"product and sum"** method. An example is provided for you

(a) $x^2 + 12x + 32$
$= (x + 8)(x + 4)$
P = **32** **+ 8** **+ 4**
S = **12**

(b) $x^2 + 4x + 3$
P =
S =

(c) $x^2 + 8x + 16$
P =
S =

(d) $x^2 – 9x + 18$
P =
S =

(e) $x^2 – 2x – 3$
P =
S =

(f) $x^2 + x – 56$
P =
S =

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2. Factor the following using **difference of squares**. An example is provided for you

(a) $x^2 - 9$
= **(x + 3)(x – 3)**

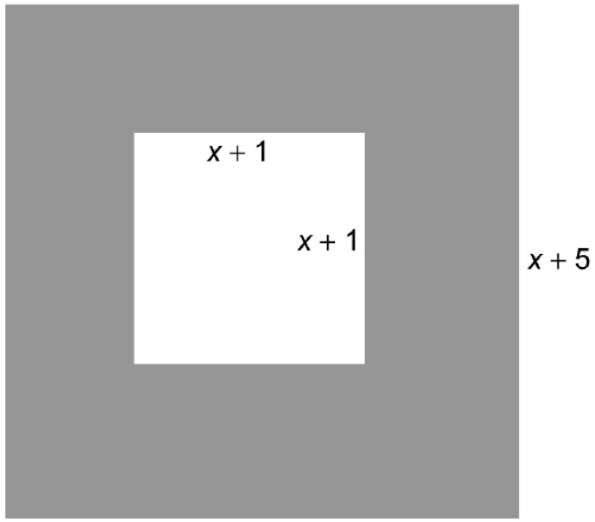
$\sqrt{x^2} = x$

$\sqrt{9} = 3$

(b) $x^2 - 16$

(c) $x^2 - 36$

3. Find an expression, in factored form, for the *shaded* region of the figure below
*** Note that **Area = Length x Width**



5.4 – FACTOR TRINOMIALS OF THE FORM $ax^2 + bx + c$

1. Factor the following using **common factoring**. *** First identify the *greatest common factor* (**GCF**)

(a) $3x^2 + 12x$ GCF =

(b) $4x^2 - 24x$ GCF =

* (c) $-7x^2 + 14x$ GCF =

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2. Factor completely. *** Always try to **common factor** first!

(a) $2x^2 + 14x + 24$

(b) $4x^2 – 24x – 28$

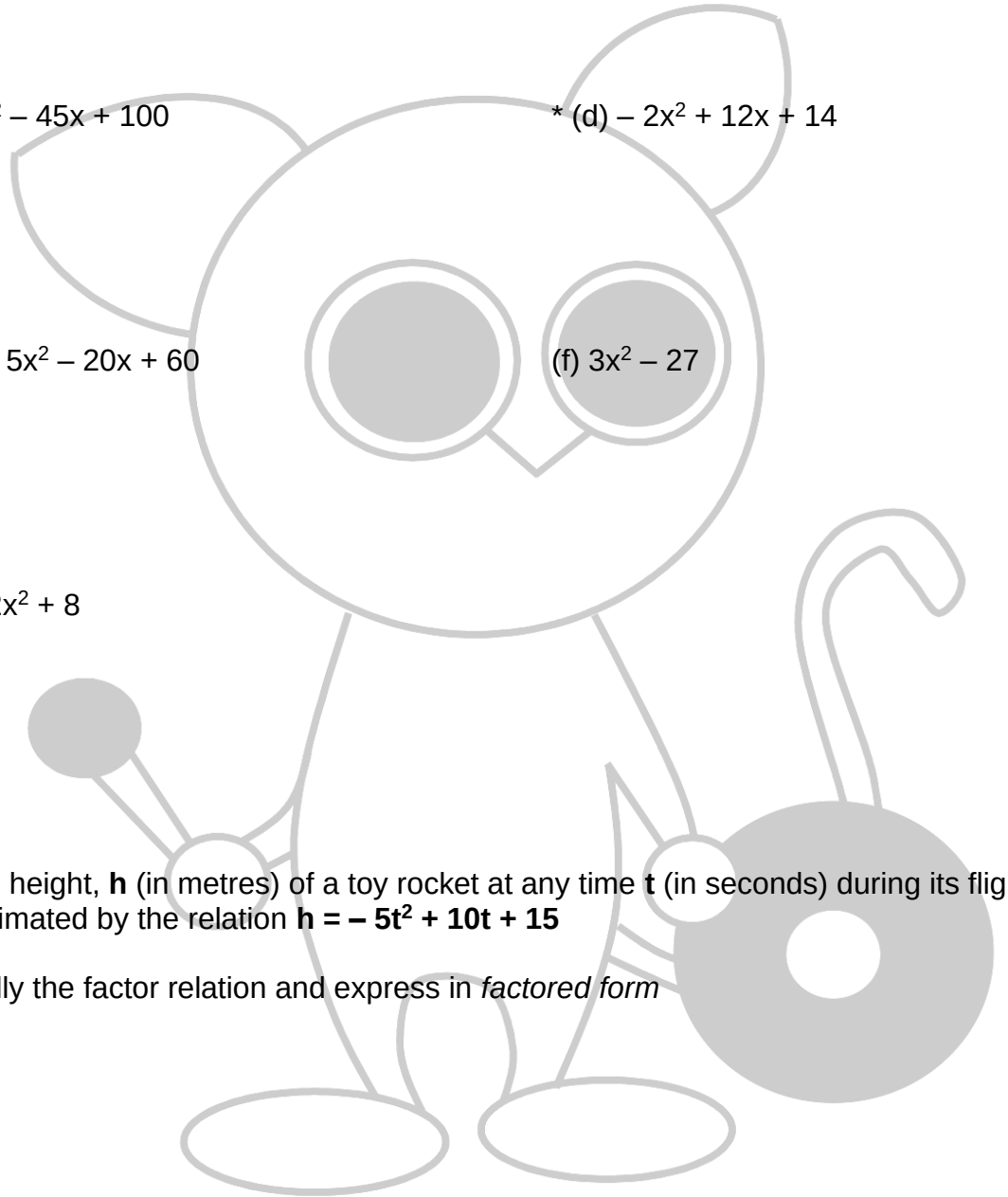
(c) $5x^2 – 45x + 100$

* (d) $– 2x^2 + 12x + 14$

* (e) $– 5x^2 – 20x + 60$

(f) $3x^2 – 27$

(g) $– 2x^2 + 8$



3. The height, **h** (in metres) of a toy rocket at any time **t** (in seconds) during its flight can be estimated by the relation $\mathbf{h = – 5t^2 + 10t + 15}$

(a) Fully the factor relation and express in *factored form*

(b) What is the **initial height** of the rocket?

* To solve for the initial height, let _____ and solve for **h**

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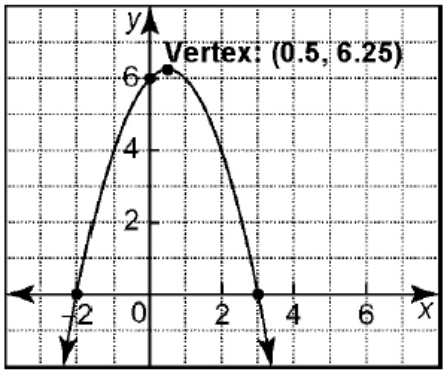
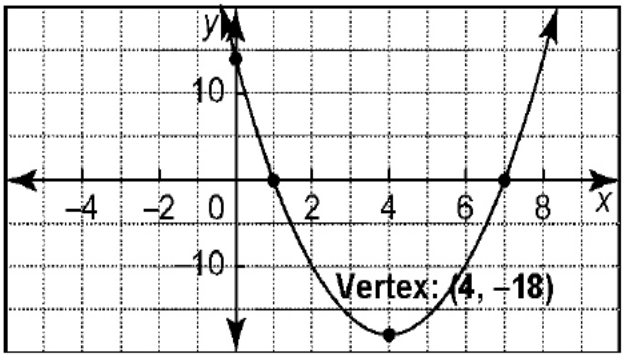
5.5 – THE x-INTERCEPTS OF A QUADRATIC RELATION

1. For each graph, determine the **x-intercepts/zeros**

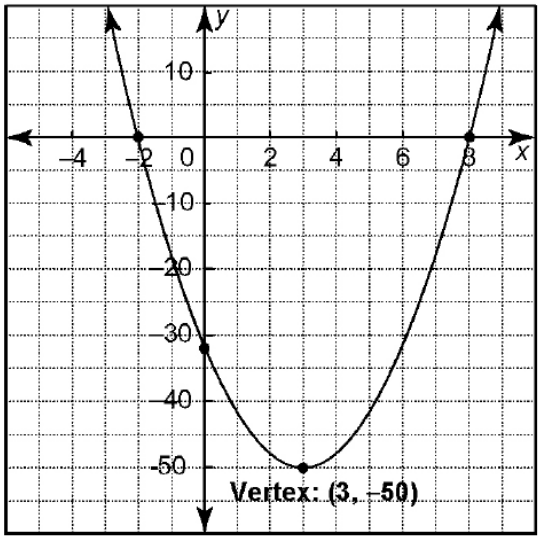
(a)



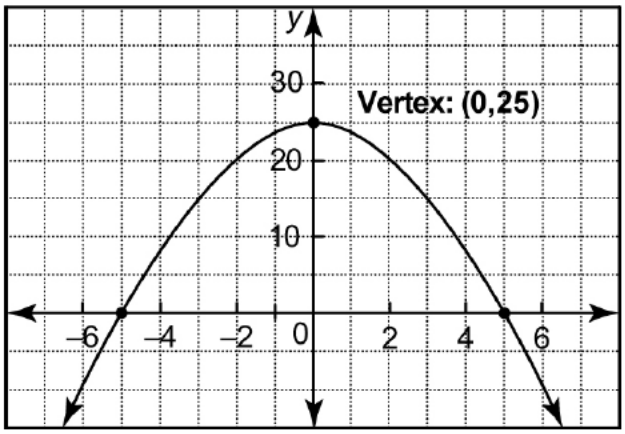
(b)



(c)



(d)



2. Find the **zeros** of each quadratic relation. An example has been provided

(a) y = (x – 1)(x + 2)
0 = (x – 1)(x + 2)

0 = x – 1 0 = x + 2
1 = x **– 2 = x**

(b) y = 3(x + 7)(x – 5)

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(c) $y = -2x(x - 6)$

3. Completely **factor** each relation and find the **zeros**

(a) $y = x^2 + 8x + 15$

(b) $y = x^2 - 2x - 8$

(c) $y = 3x^2 - 12x - 36$

* (d) $y = 2x^2 - 8$

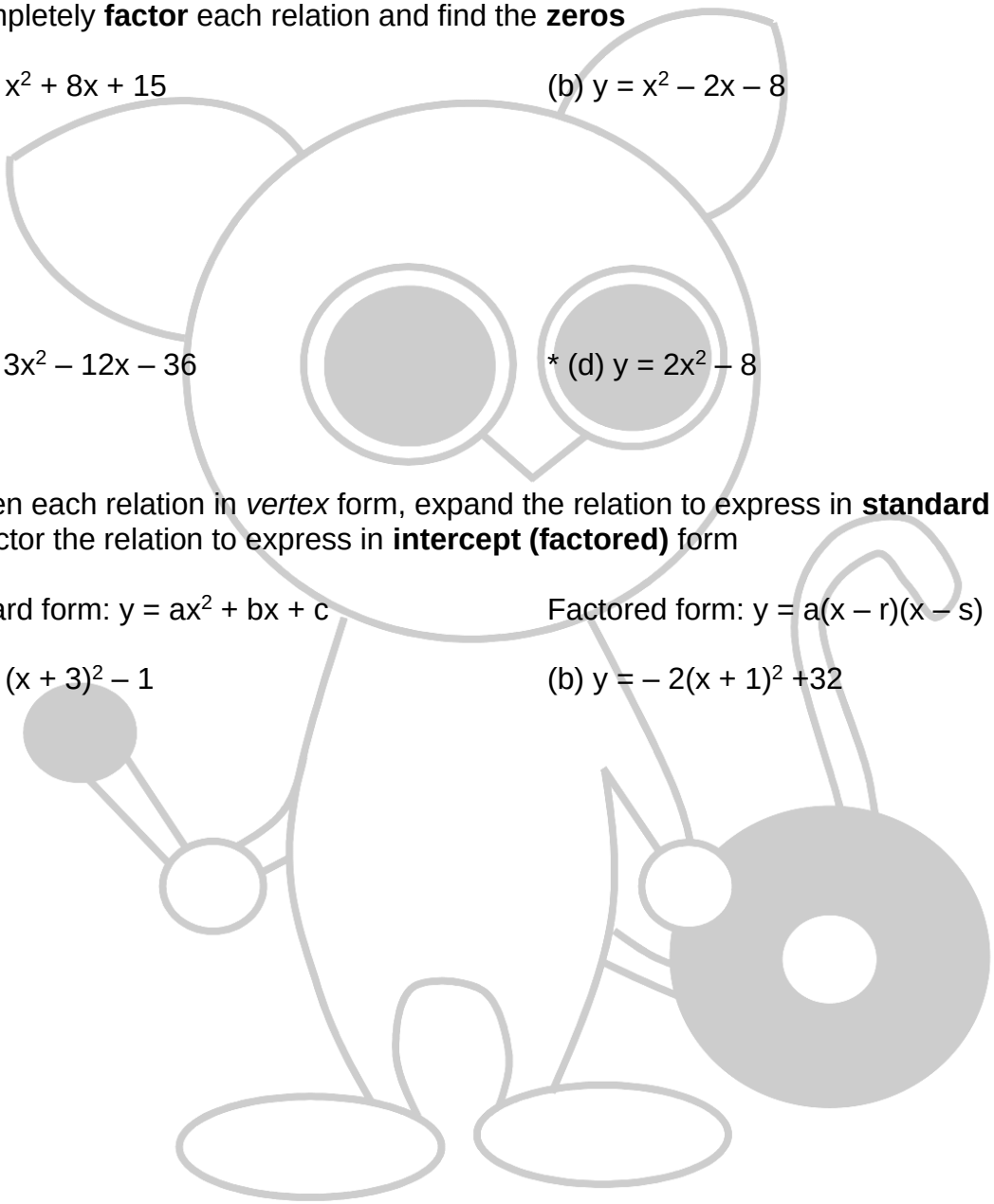
4. Given each relation in *vertex* form, expand the relation to express in **standard form** and factor the relation to express in **intercept (factored)** form

Standard form: $y = ax^2 + bx + c$

Factored form: $y = a(x - r)(x - s)$

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

(b) $y = -2(x + 1)^2 + 32$



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5.6 - SOLVE PROBLEMS INVOLVING QUADRATIC RELATIONS

1. Completely **factor** each relation and find the **zeros**

(a) $y = x^2 - 12x + 32$

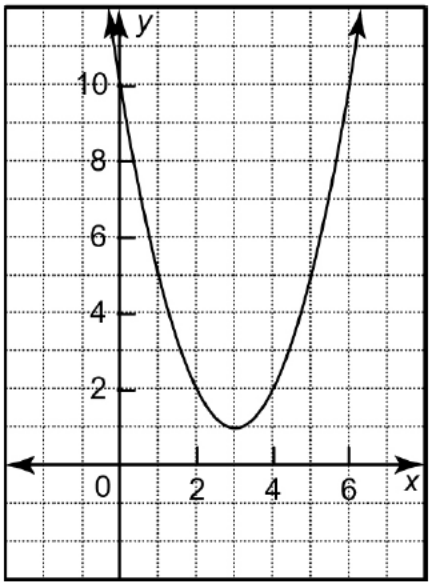
(b) $y = 2x^2 + 14x + 24$

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

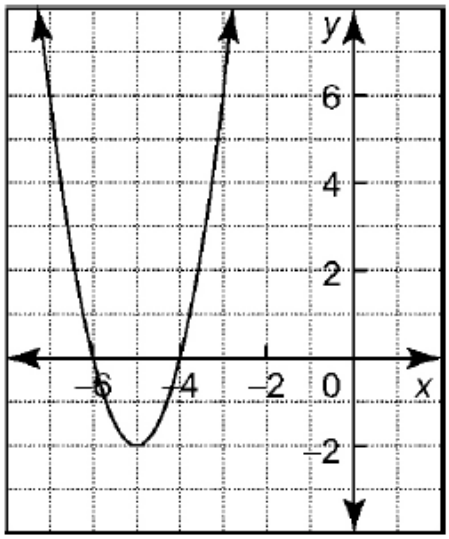
(d) $y = -3x^2 + 48$

2. For each quadratic relation, write the equation of the **axis of symmetry**

(a)



(b)



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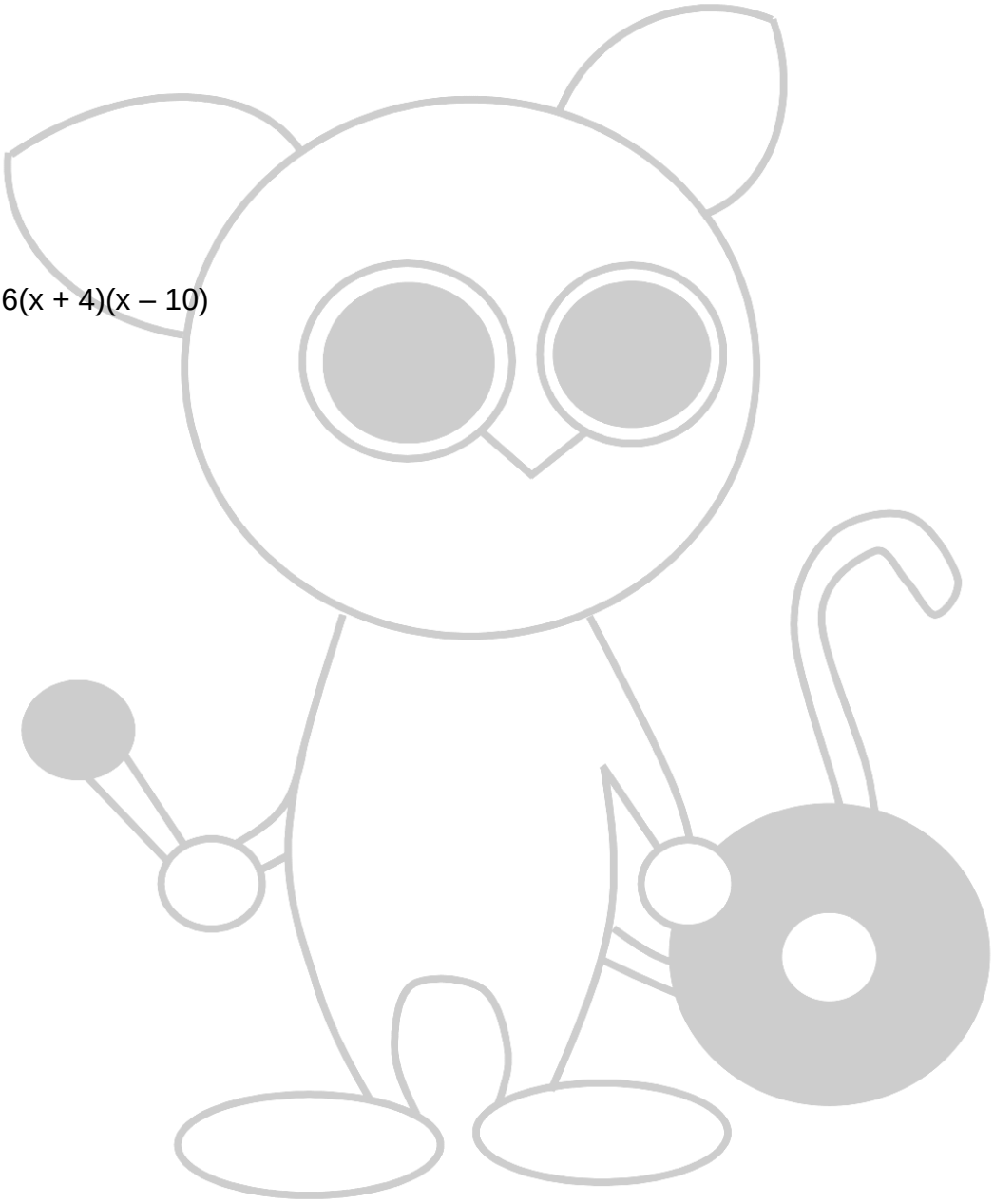
3. Find the equation of the **axis of symmetry** for each quadratic relation. *** Solve for the **zeros** first and use the formula $x = \frac{r+s}{2}$ to determine the axis of symmetry

(a) y = (x – 6)(x – 4)

(b) y = 2x(x + 6)

(c) y = 6(x + 4)(x – 10)



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SOLUTIONS

5.1

1. (b) $x^2 – 4x – 12$ (c) $x^2 – 10x – 11$ (d) $x^2 – 18x + 81$

2. (b) $16x^2 – 38x – 5$ (c) $15x^2 – 4x – 3$ (d) $4x^2 – 20x + 25$

   (e) $100x^2 + 60x + 9$

3. (a) $3x^2 + 22x + 24$ (b) 544 m^2

5.2

1. (b) $y = x^2 + 4x + 4$ (c) $y = x^2 + 12x + 36$

2. (a) $x^2 + 6x + 8$ (b) $y = x^2 – 4x + 9$ (c) $y = x^2 + 2x – 3$

3. (a) $y = 2x^2 + 12x + 18$ (b) $y = – 3x^2 + 30x – 75$

4. (a) $y = 3x^2 – 12x + 13$ (b) $y = – 2x^2 + 4x + 2$

5. (a) $y = – 3x^2 + 24x – 45$ (b) $y = 2x^2 + 4x + 7$

   (c) $y = 5x^2 + 30x + 49$

6. (a) 1 (b) 36 (c) 2

7. (a) $h = – 2t^2 + 16t + 1$ (b) (4, 33); after 4 seconds ball reaches a Maximum height of 33 metres

5.3

1. (b) $(x + 1)(x + 3)$ (c) $(x + 4)(x + 4)$ (d) $(x – 6)(x – 3)$

   (e) $(x + 1)(x – 3)$ (f) $(x – 7)(x + 8)$

2. (a) $(x + 4)(x – 4)$ (b) $(x + 6)(x – 6)$

3. $8(x + 3)$

5.4

1. (a) GCF = 3x, $3x(x + 4)$ (b) GCF = 4x, $4x(x – 6)$

   (c) GCF = – 7x, $– 7x(x – 2)$

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2. (a) $2(x + 3)(x + 4)$ (b) $4(x – 7)(x + 1)$ (c) $5(x – 4)(x – 5)$

(d) $– 2(x + 1)(x – 7)$ (e) $– 5(x + 6)(x – 2)$ (f) $3(x + 3)(x – 3)$

(g) $– 2(x + 2)(x – 2)$

3. (a) $h = – 5(t – 3)(t + 1)$ (b) Let $t = 0$, 15 m

5.5

1. (a) $x = – 2$, $x = 3$ (b) $x = 1$, $x = 7$ (c) $x = – 2$, $x = 8$

(d) $x = – 5$, $x = 5$

2. (b) $x = – 7$, $x = 5$ (c) $x = 0$, $x = 6$

3. (a) $x = – 5$, $x = – 3$ (b) $x = 4$, $x = – 2$ (c) $x = 6$, $x = – 2$

(d) $x = 2$, $x = – 2$

4. (a) $y = x^2 + 6x + 8$, $y = (x + 4)(x + 2)$

(b) $y = – 2x^2 – 4x + 30$, $y = – 2(x – 3)(x + 5)$

5.6

1. (a) $y = (x – 8)(x – 4)$, $x = 8$, $x = 4$ (b) $y = 2(x + 4)(x + 3)$, $x = – 4$, $x = – 3$

(c) $y = – (x – 5)(x + 1)$, $x = 5$, $x = – 1$ (d) $y = – 3(x + 4)(x – 4)$, $x = – 4$, $x = 4$

2. (a) $x = 3$ (b) $x = – 5$

3. (a) Zeros: $x = 6$, $x = 4$, Axis of symmetry: $x = 5$

(b) Zeros: $x = 0$, $x = – 6$, Axis of symmetry: $x = – 3$

(c) Zeros: $x = – 4$, $x = 10$, Axis of symmetry: $x = 3$

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