SM2 Unit 5 Review

Factor the greatest common factor out of each expression.

1) $35k^2 + 25$

$$5(7k^2 + 5)$$

2) $10x^2 + 2x$

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

3) $x^5 - 4x^4 + 3x^2 - 7x$

$$x(x^4 - 4x^3 + 3x - 7)$$

4) $-4x^3 + 8x^2 + 16x$

$$-4x(x^2 - 2x - 4)$$

or

$$4x(-x^2 + 2x + 4)$$

Factor each completely.

5) $6n^3 - 42n^2 - n + 7$

$$\begin{array}{c|c|c} & n & -7 \\ \hline 6n^2 & 6n^3 & -42n^2 \\ \hline -1 & -n & 7 \end{array}$$

$$(6n^2 - 1)(n - 7)$$

6) $3n^3 + 5n^2 - 24n - 40$

$$\begin{array}{c|c|c} & 3n & 5 \\ \hline n^2 & 3n^3 & 5n^2 \\ \hline -8 & -24n & -40 \end{array}$$

$$(n^2 - 8)(3n + 5)$$

7) $2n^2 - 11n + 14 \qquad 2 \cdot 14 = \dfrac{28}{-7 \cdot 4}$

$$2n^2 - 7n - 4n + 14$$

$$\begin{array}{c|c|c} & 2n & -7 \\ \hline n & 2n^2 & -7n \\ \hline -2 & -4n & 14 \end{array}$$

$$(2n - 7)(n - 2)$$

8) $25r^2 - 81$

$$\begin{array}{c|c|c} & 5r & -9 \\ \hline 5r & 25r^2 & -45r \\ \hline 9 & 45r & -81 \end{array} \quad \text{cancels out}$$

$$(5r + 9)(5r - 9)$$

9) $x^2 + 15x + 54 \qquad \dfrac{54}{9 \cdot 6}$

$$x^2 + 9x + 6x + 54$$

$$\begin{array}{c|c|c} & x & 9 \\ \hline x & x^2 & 9x \\ \hline 6 & 6x & 54 \end{array}$$

$$(x+9)(x+6)$$

10) $x^2 + 14x + 54$

$$\begin{array}{l} \dfrac{54}{} \\ 1 \cdot 54 \quad \times \\ 2 \cdot 27 \quad \times \\ 3 \cdot 18 \quad \times \\ 6 \cdot 9 \quad \times \end{array}$$

not factorable

Solve each equation using the zero factor property.

11) $(n-7)(3n+4)=0$

$n=7, \; n=-4/3$

12) $(a-1)(a-4)=0$

$a=1, \; a=4$

13) $(r+6)(4r+7)=0$

$n=-6, \; n=-7/4$

14) $(x+7)(x-8)=0$

$x=-7, \; x=8$

Solve each equation.

15) $x^2-3x-10=0$

$(x-5)(x+2)=0$

$x=5, \quad x=-2$

16) $2r^2+9r+7=0$

$\quad\frac{14}{7\cdot2}$

$2r^2+7r+2r+7=0$

$\times$	$2r$	7
r	$2r^2$	$7r$
1	$2r$	7

$(2r+7)(r+1)=0$

$r=-7/2, \; r=-1$

17) $v^2-2v=0$

$v(v-2)=0$

$v=0, \; v=2$

18) $5k^2+25k-30=0$

$5(k^2+5k-6)=0$

$5(k+6)(k-1)=0$

$k=-6, \; k=1$

19) $0=-35b^2-28b$

$0=-7b(5b+4)$

$b=0, \quad b=-4/5$

20) $x^2-49=0$

$(x+7)(x-7)=0$

$x=-7, \; x=7$

21) $3v^2-v=2$

$\quad -2 \; -2$

$3v^2-v-2=0 \quad \frac{-6}{-3\cdot2}$

$3v^2-3v+2v-2=0$

$\times$	$3v$	-1
$3v$	$3v^2$	$-3v$
2	$2v$	-2

$(3v+2)(v-1)=0$

$v=-2/3, \; v=1$

22) $7n^2-16=-24n$

$\quad +24n \quad +24n$

$7n^2+24n-16=0 \quad \frac{-112}{2\cdot56 \; \times}$

$\qquad\qquad\qquad -4\cdot28 \; \checkmark$

$7n^2-4n+28n-16=0$

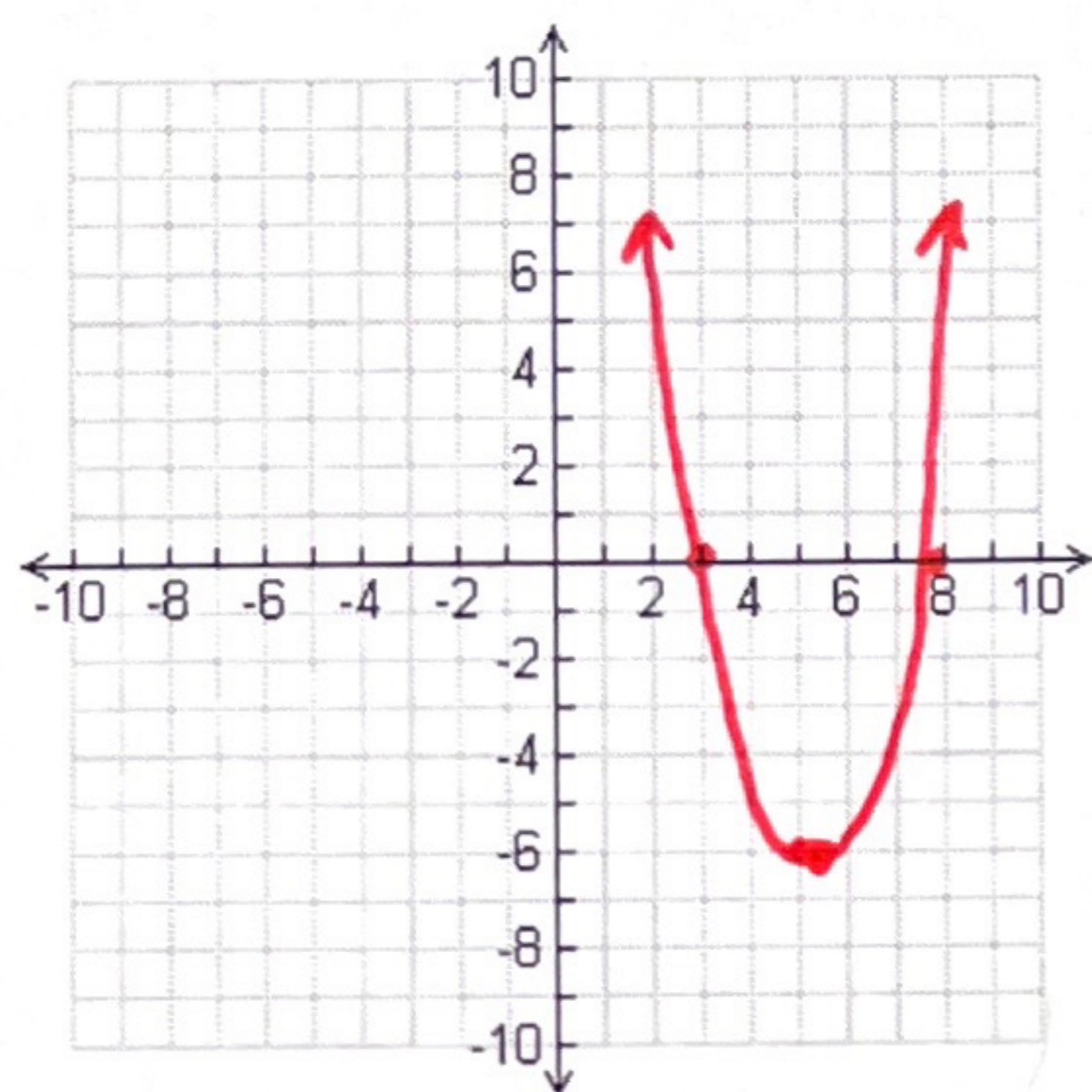| $\times$	$7n$	-4
n	$7n^2$	$-4n$
4	$28n$	-16

$(n+4)(7n-4)=0$

$n=-4, \; n=4/7$

a) Find the real roots of each quadratic function. b) Then sketch the graph of each quadratic function and label the roots. c) Determine the positive and negative intervals.
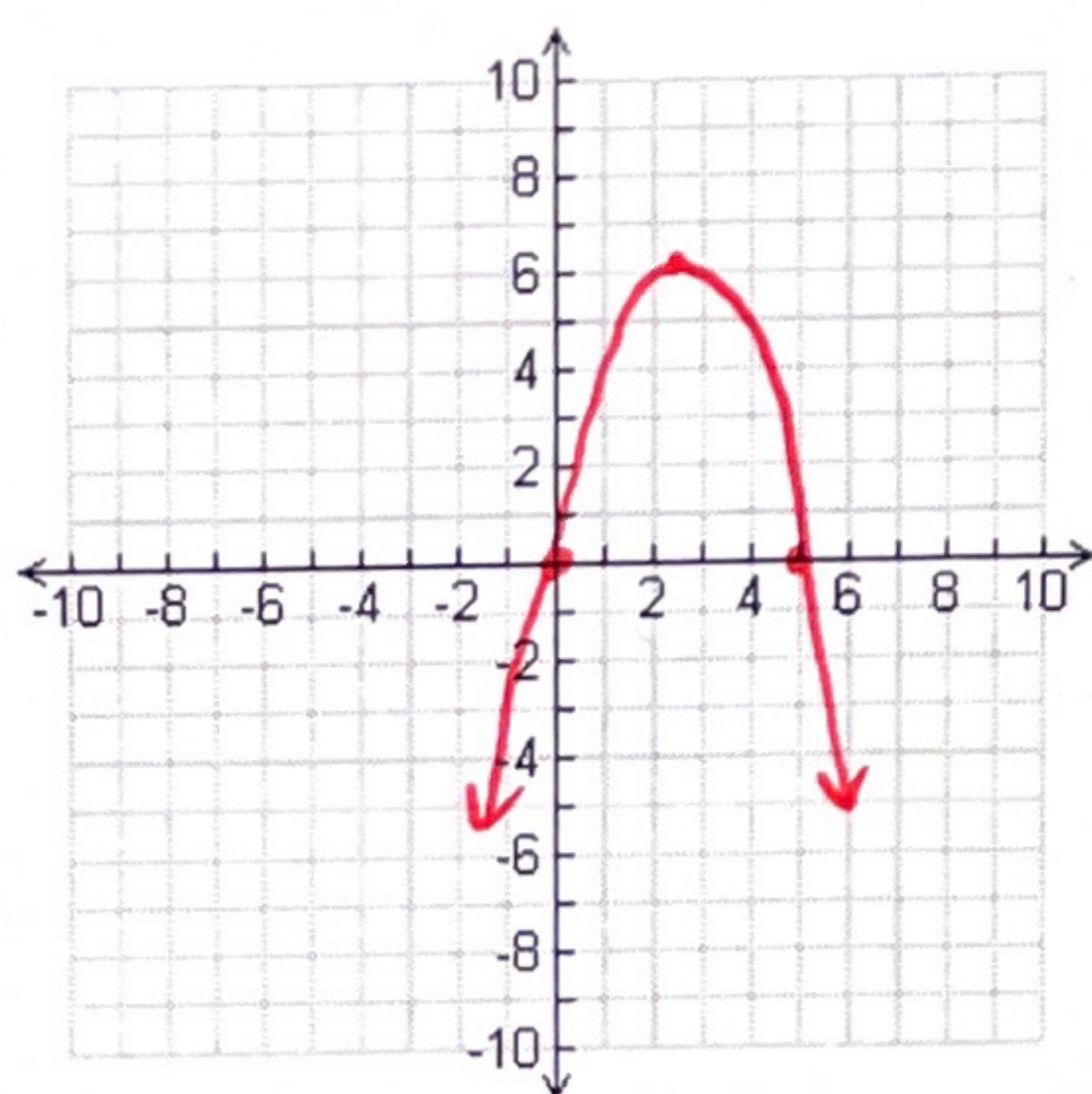
23) $f(x) = x^2 - 11x + 24$

Vertex: $(5.5, -6.25)$

x-intercept(s): $(8, 0)$ $(3, 0)$

Positive: $(-\infty, 3) \cup (8, \infty)$

Negative: $(3, 8)$

y-intercept: $(0, 24)$

x-int: $x^2 - 11x + 24 = 0$

$(x - 8)(x - 3) = 0$

$x = 8, \quad x = 3$

vertex is halfway between, so @ $x = 5.5$

$f(5) = 5.5^2 - 11(5.5) + 24 = -6.25 \rightarrow (5.5, -6.25)$

y-int is when $x = 0$

$f(0) = 0^2 - 11(0) + 24 = 24 \rightarrow (0, 24)$

24) $y = -x^2 + 5x$

Vertex: $(2.5, 6.25)$

x-intercept(s): $(0, 0)$ $(5, 0)$

Positive: $(0, 5)$

Negative: $(-\infty, 0) \cup (5, \infty)$

y-intercept: $(0, 0)$

x-int: $-x^2 + 5x = 0$

$-x(x - 5) = 0$

$x = 0, \quad x = 5$

vertex is halfway between, so @ $x = 2.5$

$y = -(2.5)^2 + 5(2.5) = 6.25 \rightarrow (2.5, 6.25)$

y-int is when $x = 0$

$y = -0^2 + 5(0) = 0 \rightarrow (0, 0)$

25) A soccer ball is kicked from the ground and travels a parabolic path modeled by
$h(t) = -16t^2 + 32t$, where $h(t)$ is the height of the soccer ball in feet above the ground
t seconds after being kicked. Assuming the ball lands on level ground, about how long is the ball
in the air? *the ball is no longer in the air when it hits the ground which has a height of 0 feet.*

$$0 = -16t^2 + 32t$$
$$0 = -16t(t-2)$$
$$t = 0, \ t = 2$$

2 seconds

26) The income in dollars for a school talent show is $I(p) = 40p - 8p^2$, where p is the ticket price.
What ticket price(s) will result in an income of \$0? *plug in 0 for income.*

$$0 = 40p - 8p^2$$
$$0 = -8p^2 + 40p$$
$$0 = -8p(p-5) \rightarrow p = 0, \ p = 5$$

price is \$0 and \$5

27) The height of a baseball in feet x seconds after it is thrown is given by
$h(x) = -16x^2 + 32x + 6$. When will the ball be at a height of 22 feet?

plug in for height

$$22 = -16x^2 + 32x + 6$$
$$-22 \qquad\qquad -22$$
$$0 = -16x^2 + 32x - 16$$
$$0 = -16(x^2 - 2x + 1)$$
$$0 = -16(x-1)(x-1) \rightarrow \boxed{x = 1 \text{ second}}$$

28) As part of a science experiment, Carson designs and creates a cushioned egg carrier. He puts an
egg inside it, and then drops it from a window that is 64 feet high to see whether his design can
safely cushion the egg and keep it from breaking. The egg's height in feet x seconds after being
dropped is given by $h(x) = 64 - 16x^2$. After how many seconds will the egg hit the ground?

height = 0

$$0 = 64 - 16x^2$$
$$0 = -16x^2 + 64$$
$$0 = -16(x^2 - 4)$$
$$0 = -16(x+2)(x-2)$$
$$x = \cancel{-2}, \ x = 2$$

2 seconds