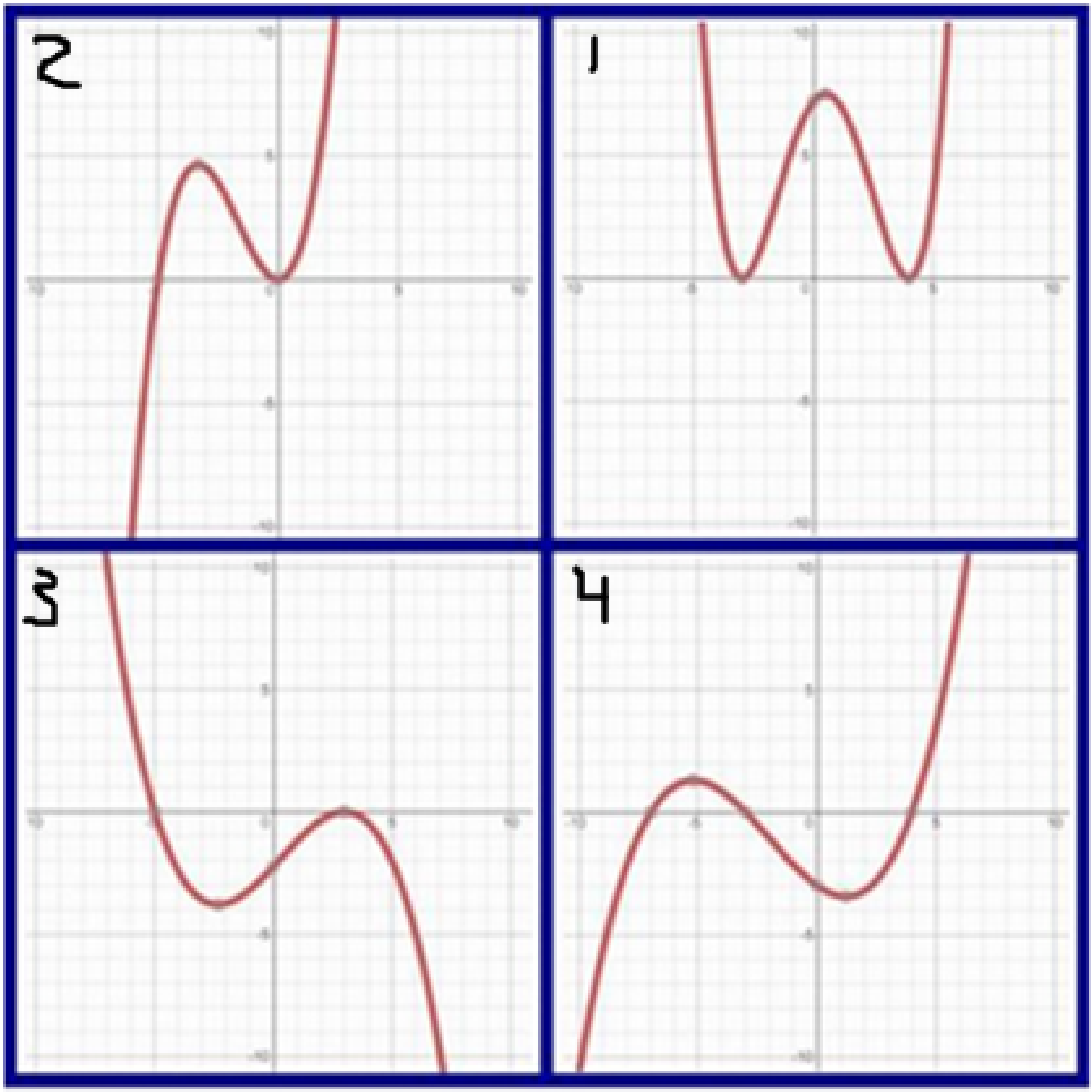
Which one doesn't belong?



$$f(x) = 4 - 3x^2 - x^3$$

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

- degree 3
- $a < 0$

start high
end low

- y int ($x = 0$)

(0, 4)

- x int ($y = 0$)

$0 = -x^3 - 3x^2 + 4$

$0 = -(x^3 + 3x^2 - 4)$

RRT $\quad P(x) = x^3 + 3x^2 - 4$

$a = \pm 1 \quad b = \pm 1, \pm 2, \pm 4$

$P\left(\frac{b}{a}\right) = 0 \quad P(1) = 1 + 3 - 4 = 0$

$$\begin{array}{c|cccc} 1 & 1 & 3 & 0 & -4 \\ & \downarrow & 1 & 4 & 4 \\ \hline & 1 & 4 & 4 & 0 \end{array}$$

$P(x) = (x-1)(x^2 + 4x + 4)$
$= (x-1)(x+2)(x+2)$

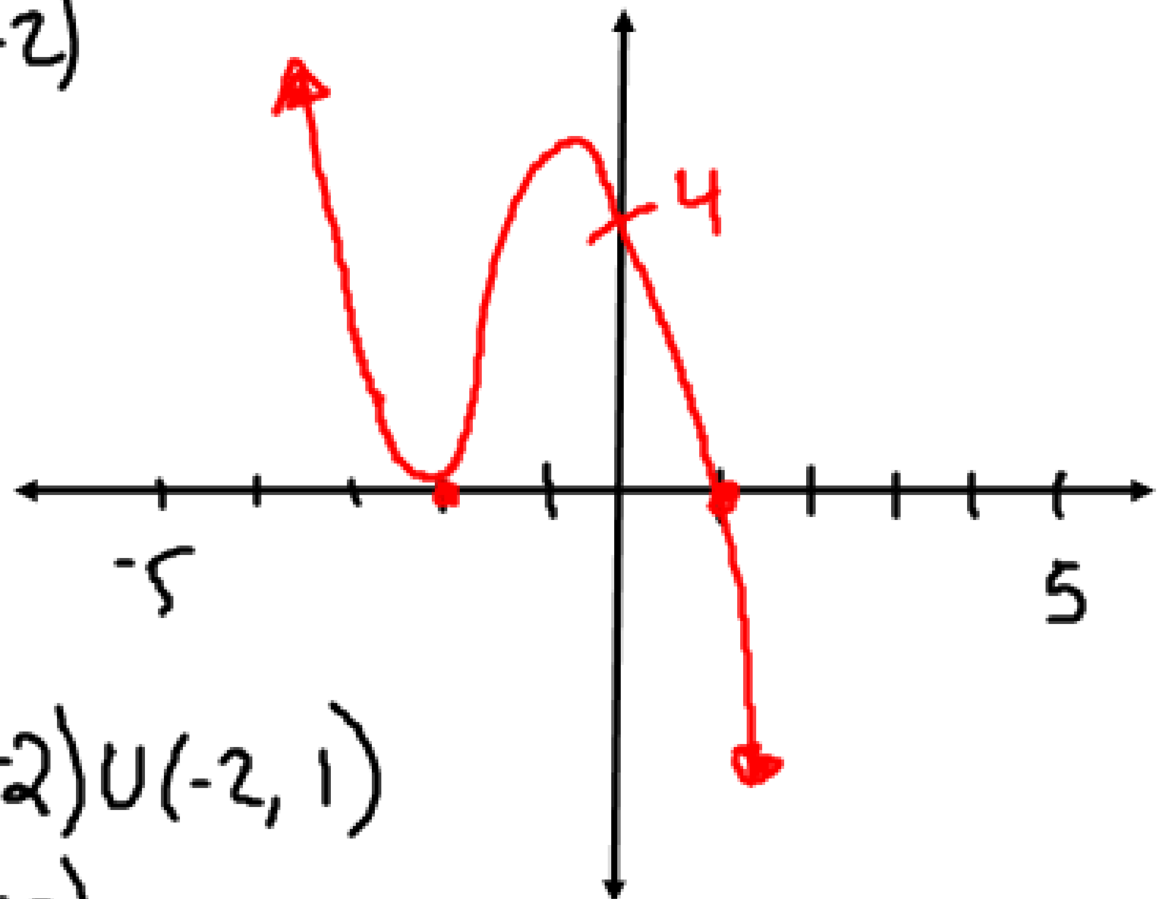
$0 = -(x-1)(x+2)(x+2)$

x int:

$(1,0)$ $(-2,0)$

$\uparrow$

Bounce



$f(x) > 0 : x \in (-\infty, -2) \cup (-2, 1)$

$f(x) < 0 : x \in (1, +\infty)$

$$f(x) = -x^{4} + 4x^3 - x^2 - 6x$$

$$f(x) = -x(x^3 - 4x^2 + x + 6) \rightarrow f(x) = \overset{(x-0)}{-x}(x-2)(x-3)(x+1)$$

$P(x) = 1x^3 - 4x^2 + x + 6$

$a = \pm 1$

$b = \pm 1, \pm 2, \pm 3, \pm 6$

$\frac{b}{a} = \pm 1, \pm 2, \pm 3, \pm 6$

$P(2) = 8 - 16 + 2 + 6$

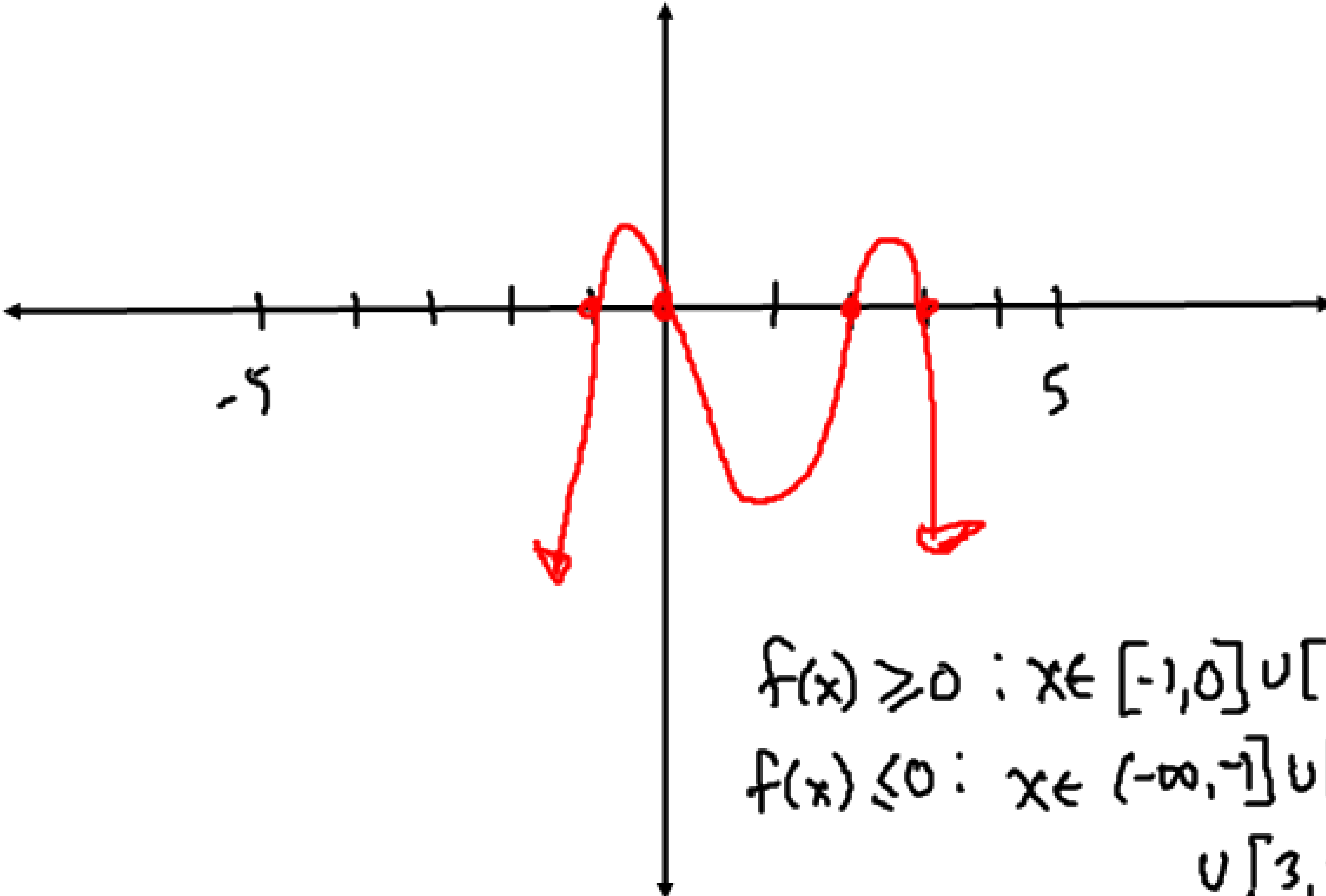
$= 0$

2	1	−4	1	6
	↓	2	−4	−6
	1	−2	−3	0

$P(x) = (x-2)(x^2 - 2x - 3)$

$= (x-2)(x-3)(x+1)$

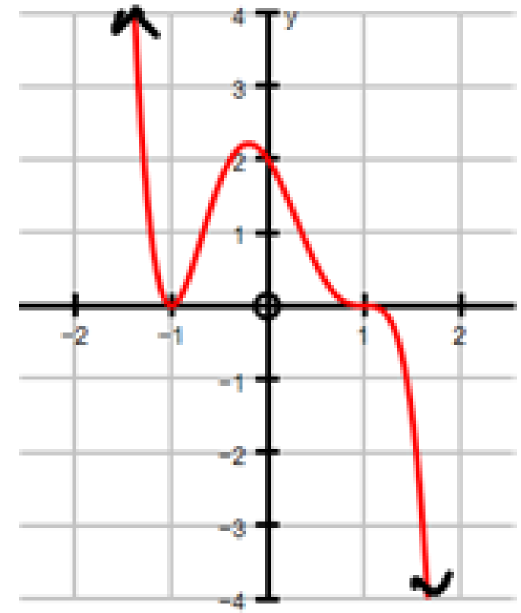
- degree : 4
- end behaviour : start low
  end low
- y-int $(x=0)$
  $(0,0)$
- x-int $(y=0)$
  $(2,0)$ $(3,0)$ $(-1,0)$ $(0,0)$



$f(x) \geq 0 : x \in [-1,0] \cup [2,3]$

$f(x) \leq 0 : x \in (-\infty,-1] \cup [0,2]$
$\cup [3,\infty)$

For the polynomial graphed below, determine:



(a) the sign of the leading coefficient
(b) the x and y-intercepts
(c) the intervals where the function is positive and the intervals where it is negative
(d) the equation for the polynomial function (in factored and expanded form)

a) $a < 0$

b) y-int $(0,2)$

x-int $(-1,0)$ $(1,0)$

c) $f(x) > 0$: $x \in (-\infty,-1) \cup (-1,1)$

$f(x) < 0$: $x \in (1, \infty)$

d) $0 = (x+1)^2(x-1)^3$

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

$2 = a(0+1)^2(0-1)^3$

$2 = -a$

$-2 = a$

$y = -2(x+1)^2(x-1)^3$ ← factored form.

$$
\begin{aligned}
y &= -2(x+1)^2(x-1)^3 \\
&= -2(x+1)(x+1)(x-1)(x-1)(x-1) \\
&= -2(x+1)(x-1)(x+1)(x-1)(x-1) \\
&= -2(x^2-1)(x^2-1)(x-1) \\
&= -2(x^4-2x^2+1)(x-1) \\
&= -2(x^5-x^4-2x^3+2x^2+x-1) \\
&= -2x^5+2x^4+4x^3-4x^2-2x+2 \quad \leftarrow \text{expanded form.}
\end{aligned}
$$

Pg. 146

Your Turn

one after another — whole — multiply

Three consecutive integers have a product of −210.

a) Write a polynomial function to model this situation.

b) What are the three integers?

let a number be n

$-210 = (n-1)(n)(n+1)$

$-210 = (n^2-1)(n)$

$-210 = n^3-n$

$0 = n^3-n+210$

$(n-1)(n)(n+1)$

$(n-2)(n-1)(n)$

$(n)(n+1)(n+2)$

RRT $P(n) = n^3-n+210$

$a = \pm 1 \quad b = \pm 1, \pm 2, \pm 3, \pm 5, \pm 6, \pm 7$

$\frac{b}{a} =$

$P(-6) = 0$

$$\begin{array}{r|rrrr} -6 & 1 & 0 & -1 & 210 \\ & \downarrow & -6 & 36 & -210 \\ \hline & 1 & -6 & 35 & 0 \end{array}$$

$P(n) = (n+6)(n^2-6n+35)$

Discriminant $\Delta = b^2 - 4ac$

$\Delta < 0$

$$P(n) = (n+6)\underbrace{(n^2 - 6n + 35)}_{\text{no real roots}}$$

$0 = (n+6)(n^2 - 6n + 35)$

$n + 6 = 0$

$n = -6$

1st # is -7

our 2nd # is -6

3rd # -5

in order

whole #s

multiply

Your Turn

Three consecutive integers have a product of −210.

a) Write a polynomial function to model this situation.

b) What are the three integers?

$(n)(n-1)(n-2)$

$(n-1)(n)(n+1)$

let a number be n

$-210 = n(n+1)(n+2)$

$-210 = (n^2+n)(n+2)$

$-210 = n^3+2n^2+n^2+2n$

$0 = n^3+3n^2+2n+210$

$a: \pm 1 \quad b = \pm 1, \pm 2, \pm 3, \pm 5, \pm 7, \pm 10$

$P(n) = n^3+3n^2+2n+210$

$P(-7) = 0$

$$\begin{array}{r|rrrr} -7 & 1 & 3 & 2 & 210 \\ & \downarrow & -7 & 28 & -210 \\ \hline & 1 & -4 & 30 & \end{array}$$

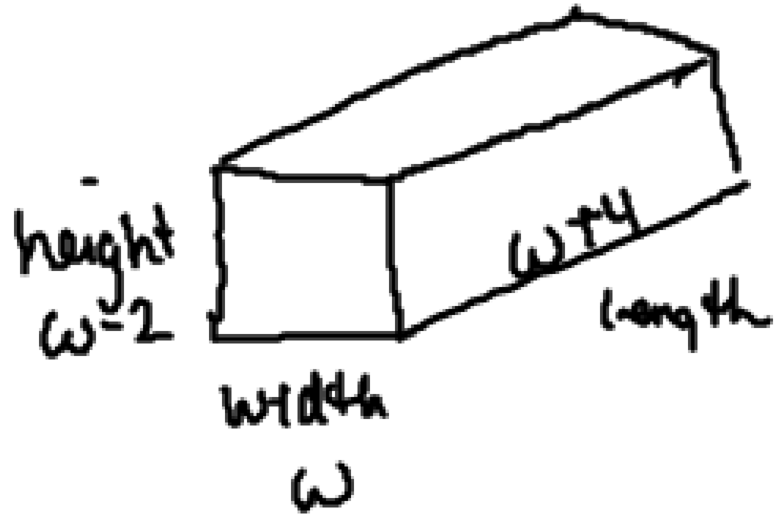
$P(n) = (n+7)(n^2-4n+30)$

Discriminant $\Delta = b^2-4ac$

$\Delta < 0$

pg 150

15. The width of a rectangular prism is w centimetres. The height is 2 cm less than the width. The length is 4 cm more than the width. If the magnitude of the volume of the prism is 8 times the measure of the length, what are the dimensions of the prism?



$$V = l \times w \times h$$
$$= (w+4)(w)(w-2)$$

$$8(w+4) = (w+4)(w)(w-2)$$
$$8w + 32 = w(w^2 + 2w - 8)$$
$$8w + 32 = w^3 + 2w^2 - 8w$$
$$0 = w^3 + 2w^2 - 16w - 32$$

$$0 = \underbrace{w^3 + 2w^2}\ \underbrace{-16w - 32}$$
$$0 = w^2(w+2) - 16(w+2)$$
$$= (w+2)(w^2 - 16)$$
$$0 = (w+2)(w-4)(w+4)$$

$w = -2$ $\quad$ $w = 4$ $\quad$ $w = -4$

reject no neg width

width = 4cm

length = 4+4=8 cm

height = 4-2 =2 cm

4cm x 8cm x 2cm

HW: pg 149 #10, 14, 15,16, chapter review