Before we begin, are there any questions from last day's work?

2.8.1
pp. 224-225 #4(a–c), 6, 7, 10

2.9.1
p. 230 #1-4

Today's work

pp. 244-245 1, 3-7

p.247 #17

p. 225

7. The daily profit, P dollars, of a cotton candy vendor at the fair is described by the function $P = -60x^2 + 240x - 80$, where x dollars is the selling price of a bag of cotton candy.

a) What should the selling price of a bag of cotton candy be to maximize daily profits?

b) What is the maximum daily profit?

a) $P = -60x^2 + 240x - 80$

$= -60(x^2 - 4x) - 80$

$= -60(x^2 - 4x + 4 - 4) - 80$

$= -60(x-2)^2 - 60(-4) - 80$

$= -60(x-2)^2 + 240 - 80$

$= -60(x-2)^2 + 160$

∴ the max. Revenue is $160, when x is 2.

if $x = \frac{-b}{2a}$

$= \frac{-(240)}{2(-60)}$

$= \frac{-240}{-120}$

$= 2$

∴ $P = -60(2)^2 + 240(2) - 80$

$= -240 + 480 - 80$

$= 160$

p. 225

10. On a forward somersault dive, a diver's height, h metres, above the water is given by $h(t) = -4.9t^2 + 6t + 3$, where t is the time in seconds after the diver leaves the board.

a) Graph the function.

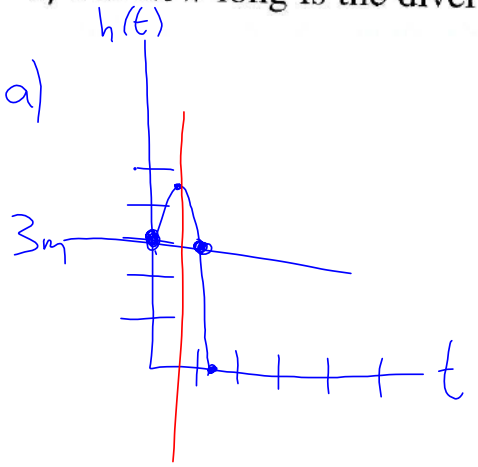
b) Determine the diver's maximum height above the water.

c) How long does it take the diver to reach the maximum height?

d) For how long is the diver higher than 3 m above the water?

$a = -4.9 \quad b = 6 \quad c = 3$

a)



b) complete the square

from: $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

use $x = \frac{-b}{2a}$

or $t = \frac{-b(b)}{2a(-4.9)}$

$\doteq 0.612$

$\doteq 0.61$ sec

c) ∴ max height when $t \doteq 0.61$

b) $h(1.58) \doteq -4.9(0.61)^2 + 6(0.61) + 3$

$\doteq 4.83$ m

d) if the time from 3m to 4.8 m is 0.61 sec, then from 4.8m down to 3m is 0.61 sec.

∴ total time above 3m

$\doteq 0.61 + 0.61$

$\doteq 1.22$ sec

p. 230 #1

A 1. A packaging company makes boxes using cardboard 25.0 cm long and 20.0 cm wide. Determine the size of squares to be cut from the corners for each of these boxes. Determine the dimensions of each box.

a) a box with volume 500 cm^3

b) a box with the maximum possible volume

#2 if cardboard is 25 cm by 25 cm

$V = x(25-2x)(25-2x)$

p. 230 #3

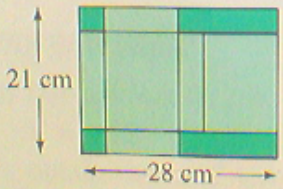
B 3. A packaging company is making another style of box from cardboard 28.0 cm long and 21.0 cm wide. This box has a top that comes from the same piece of cardboard. The diagram (below left) shows how it is made.

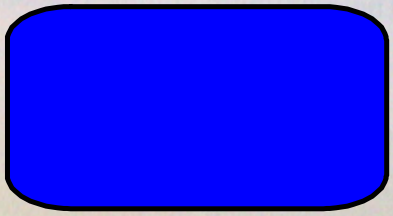
a) Let x centimetres represent the side length of each square cut from the corners. Write the volume of the box as a cubic function of x.

b) Graph the function in part a. Use a graphing calculator if you have one.

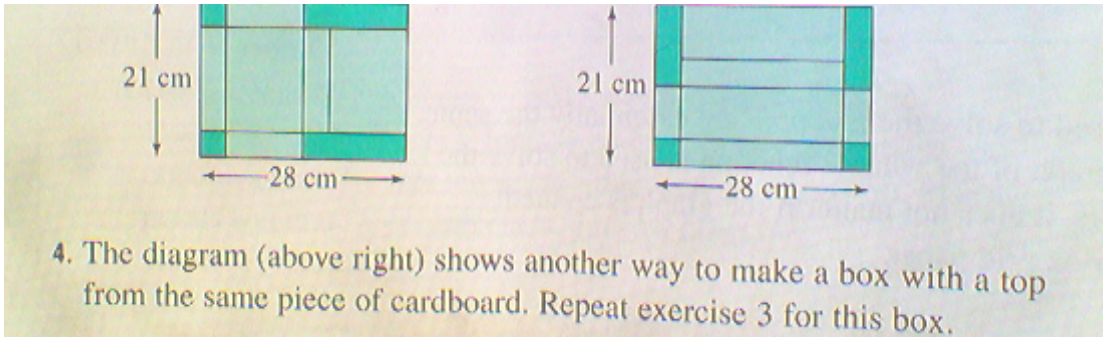
c) What size of square is cut from the corners to have a box with volume 375 cm^3? What are the dimensions of the box?

d) What size of square is cut from the corners to have a box with the maximum volume? What are the dimensions of this box?





p. 230 #4



4. The diagram (above right) shows another way to make a box with a top from the same piece of cardboard. Repeat exercise 3 for this box.

Write "the" equation of a polynomial function.

vs.

Write "an" equation of a polynomial function.

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

p.244

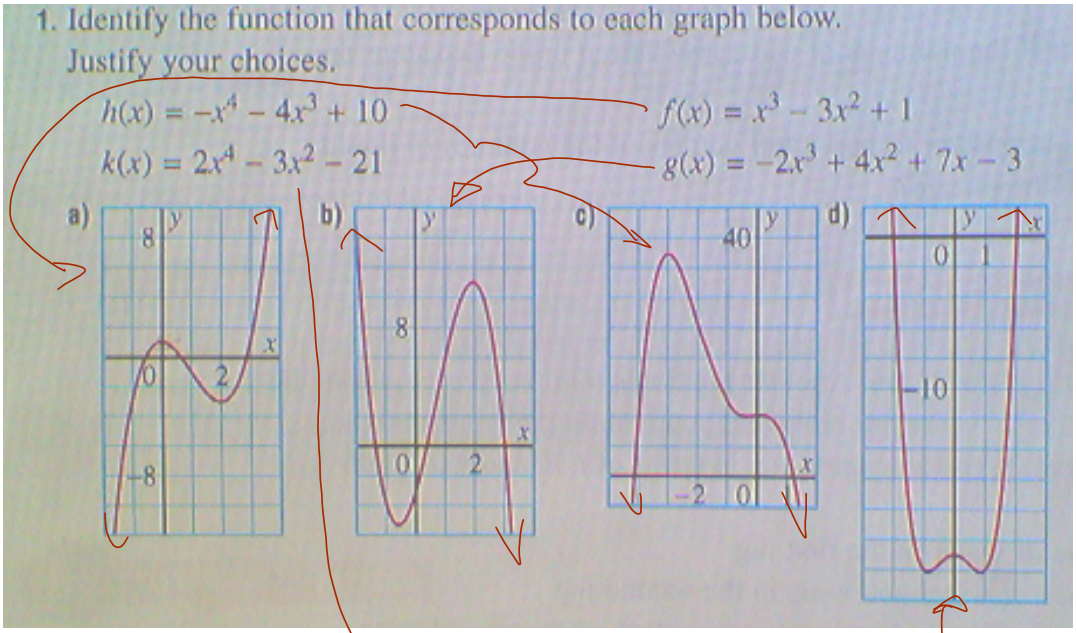
1. Identify the function that corresponds to each graph below. Justify your choices.

$h(x) = -x^4 - 4x^3 + 10$

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

$k(x) = 2x^4 - 3x^2 - 21$

$g(x) = -2x^3 + 4x^2 + 7x - 3$



3. Determine the zeros of each polynomial function.

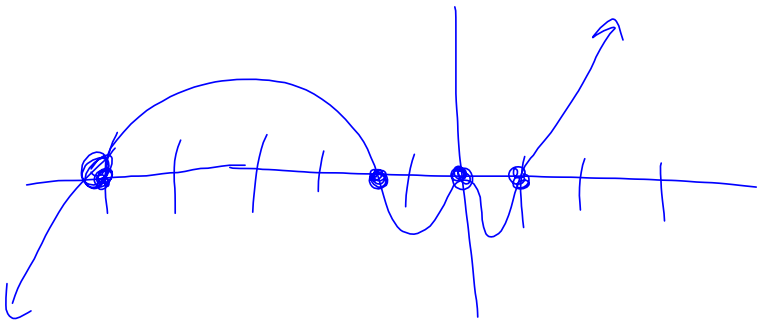
a) $g(x) = (x - 3)(2x + 5)(x + 2)^2$ b) $f(x) = 2x^2(3x + 4)(x + 5)(x - 1)$

Zeros: $3, -2, \frac{-5}{2}$

Order: $1, 2, 1$

$\frac{-4}{3}, -5, 1, 0$

$1, 1, 1, 2$



4. The zeros of four functions are given below.

i) Which function has a zero of order 2? b

ii) Which function has a zero of order 3? d

iii) Write a polynomial function that has each set of zeros.

a) 3, −2, 1 b) 0, 0, 1 c) −4, 5, −1 d) −3, −3, −3

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

c) $y=a(x+4)(x-5)(x+1)$

b) $y=ax^2(x-1)$

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

5. Refer to the graphs on page 245.

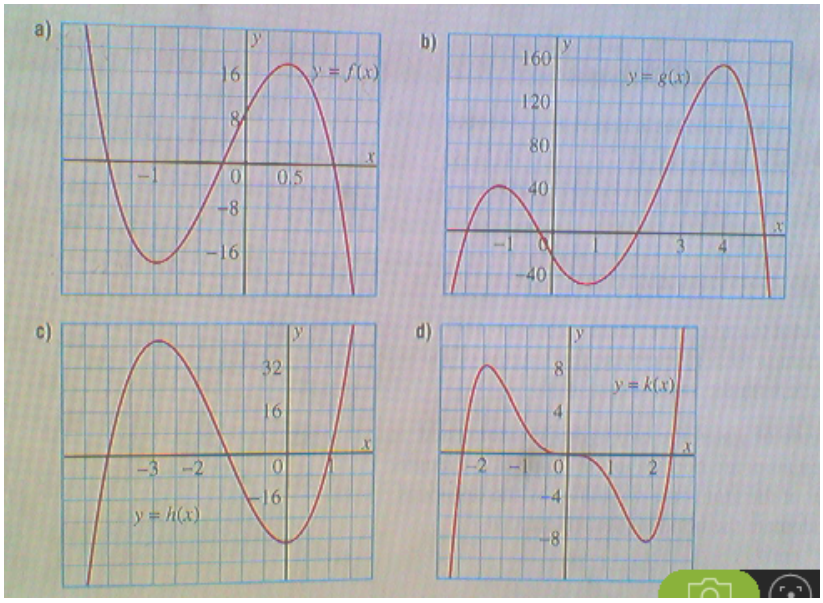
i) Which functions have an odd degree? Explain. a, c, d

ii) Which functions have an even degree? Explain. b

iii) Which functions have a negative leading coefficient? Explain. a, b

iv) Which functions have a positive leading coefficient? Explain. c, d

v) Which graphs have symmetry? Describe the symmetry.



p.246

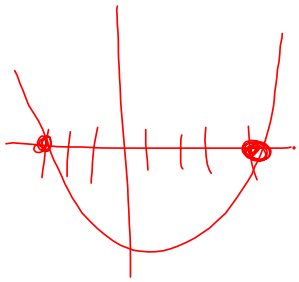
6. State the zeros of each function, then sketch its graph.

a) $f(x) = (x + 3)(x - 4)$

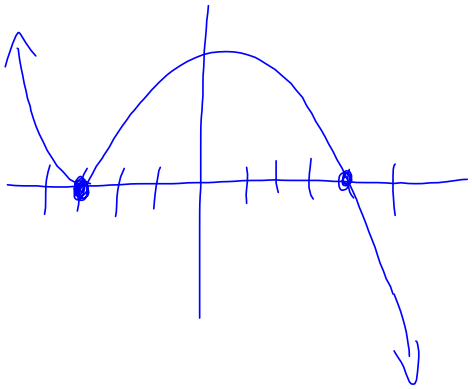
b) $f(x) = -(x + 3)^2(x - 4)$

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

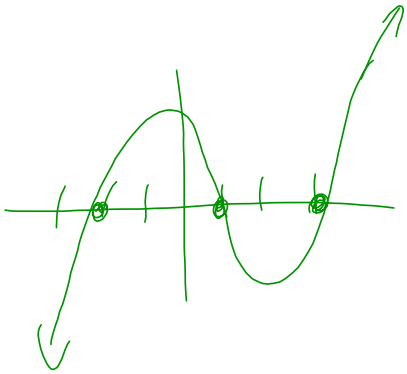
a) Zeros: $-3, 4$
order: $1, 1$



b) Zeros: $-3, 4$
order: $2, 1$



c) Zeros: $1, -2, 3$
order: $1, 1, 1$



7. Determine the equation of each function, then sketch its graph.
   a) a cubic function with zeros −3, 4, 4; graph passes through (5, 12)
   b) a quartic function with zeros −2, 0, 0, 1; graph passes through (−3, −12)

a) $y = a(x+3)(x-4)^2$ $(5, 12)$ (x, y)

$12 = a(5+3)(5-4)^2$

$12 = a(8)(1)^2$

$12 = 8a$

$\frac{12}{8} = a$

$\therefore a = \frac{3}{2}$

$\therefore y = \frac{3}{2}(x+3)(x-4)^2$ is the equation.

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

$(-12) = a(-3)^2(-3+2)(-3-1)$

$-12 = a(9)(-1)(-4)$

$-12 = 36a$

$a = \frac{-12}{36}$

$= -\frac{1}{3}$

$\therefore y = -\frac{1}{3}x^2(x+2)(x-1)$ is the equation.

p.247

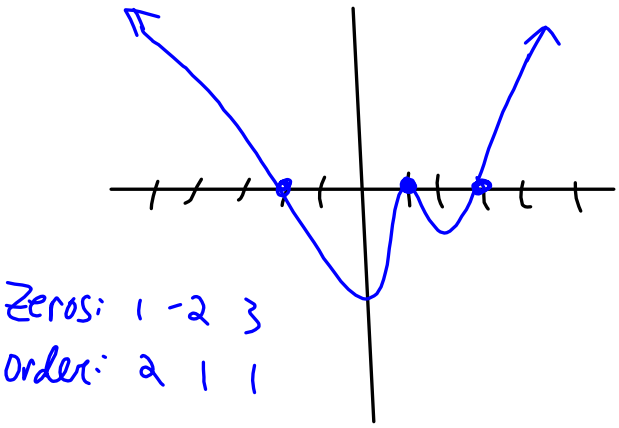
17. Sketch a graph of each function. State its domain and range.

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

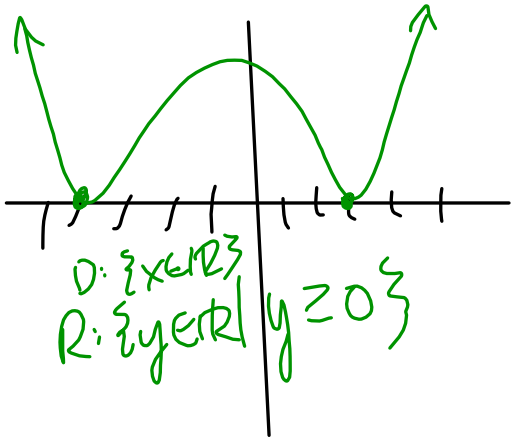
b) $y = (x-3)^2(x+4)^2$

c) $y = x^3(x-1)$ Zeros: 0 1 Order: 3 1

Zeros: 3 -4 Order: 2 2



Zeros: 1 -2 3
Order: 2 1 1



D: $\{x \in \mathbb{R}\}$
R: $\{y \in \mathbb{R} \mid y \geq 0\}$