COLLEGE REVIEW MATH
SECTION 2C

GRAPHING POLYNOMIAL FUNCTIONS

Find the roots for each polynomial function.

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

x = 0, 3, -4

2) $y = x^2(x - 7)(x + 6)$

x = 0, 7, -6

**Now consider the graphs for each using your graphing calculator. What interesting coincidence occurs for each? For #2, change the WINDOW settings so that y-min = -100 and y-max = 100

The graph intersects the x-axis at the solutions.

**How was the shape of the graph different in #2 compared to #1?

It touched, but did not cross the x-axis at x = 0. (did a U-turn)

3) $y = (x + 5)(x - 1)^2$

x = -5, 1

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

x = 0, -3, 5

**You may want to reset the WINDOW for #4 to -1000 & 1000 for the y, and -6 & 6 for the x
**How did the graph for #4 differ?

The graph for #4 snaked (or twisted) through the x-axis at x = 0

TYPES OR ROOTS: SINGLES, DOUBLES OR TRIPLES

A single root (or exponent of 1) passes ***directly thru*** the x-axis at the root.

A double root (or exponent of 2) ***changes direction*** at the x-axis (or it forms a **"U"** at the root.

A triple root (or exponent of 3) ***twists*** its way thru the x-axis at the root.

Determine how many of each type of root (single, double or triple) each function has.

1) $f(x) = (x - 10)(x + 1)^2(x - 2)$

single: 2
double: 1
triple: 0

2) $f(x) = -3x^2(x + 4)^3(x + 9)(x + 7)^2$

single: 1
double: 2
triple: 1

SIGN ANALYSIS

Determine if the graph for each function is above or below the x-axis for each value given.
Simply plug the number in to the equation, keeping track of the sign for each portion.

EXAMPLE: $f(x) = x^3(x-7)(x+2)^2$ @x = -1

plug in each part& keep track of sign:

x^3: $(-1)^3$ = negative
$(x-7)$ $(-1-7)$ = negative
$(x+2)^2$ $(-1+2)^2$ = positive

answer = negative X negative X positive = positive

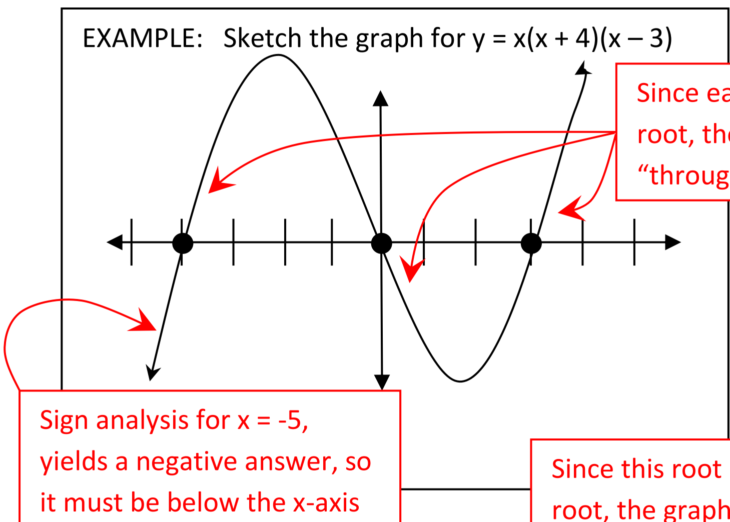
Therefore, x@-1 is above the x-axis

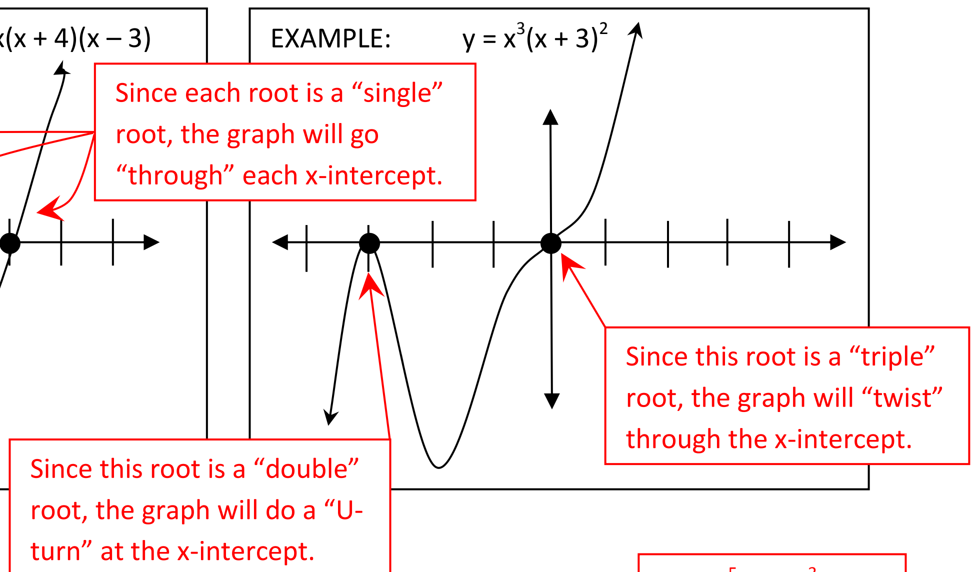
1) $f(x) = (x+11)^2(x-4)(x+4)$ @x = -3

$(-3+11)^2$, short cut; anything^2 = positive
$(-3-4)$ = negative
$(-3+4)$ = positive
answer = positive X negative X positive = negative

Therefore, x@-3 is *below* the x-axis

GRAPH USING SIGN ANALYSIS & TYPE OF ROOT



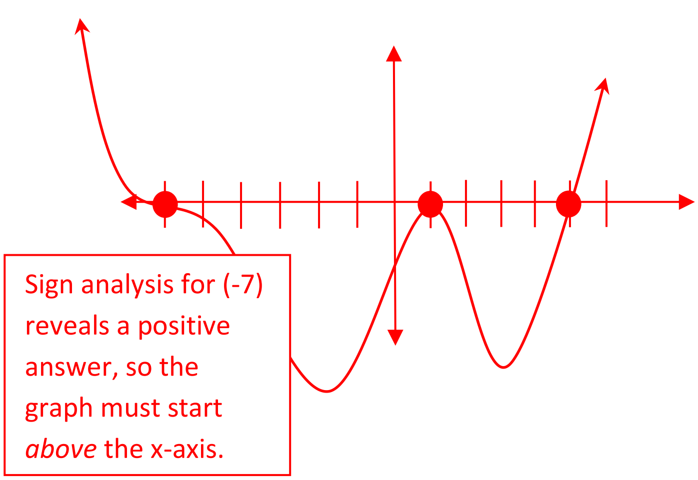


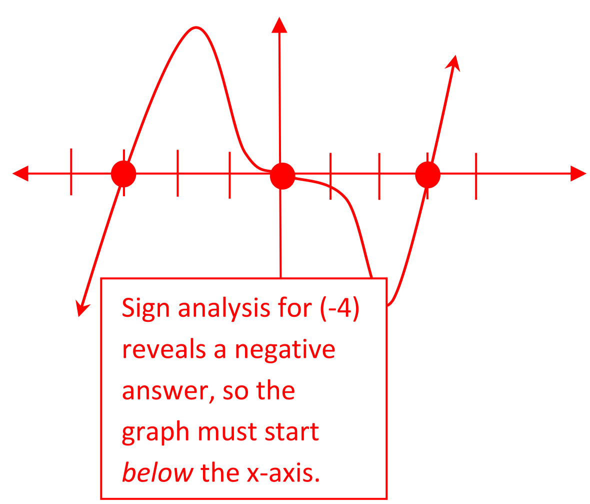
Your turn. Sketch the following.

1) $f(x) = (x+6)^3(x-1)^2(x-5)$

2) $y = 2x^5 - 18x^3$

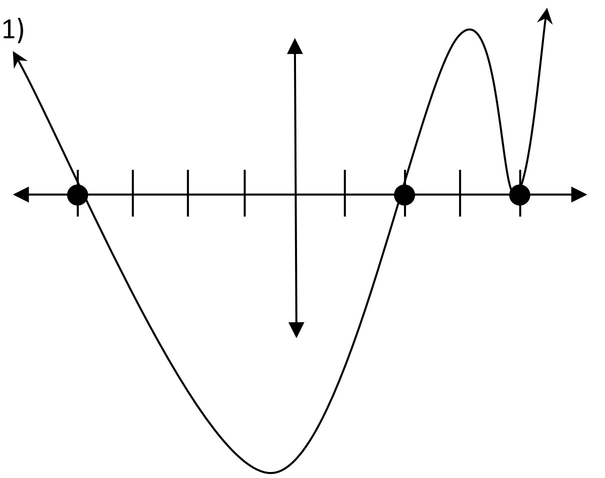
$y = 2x^5 - 18x^3$
$y = 2x^3(x^2 - 9)$
$y = 2x^3(x-3)(x+3)$





Given the graph, write one possible equation for the polynomial function.

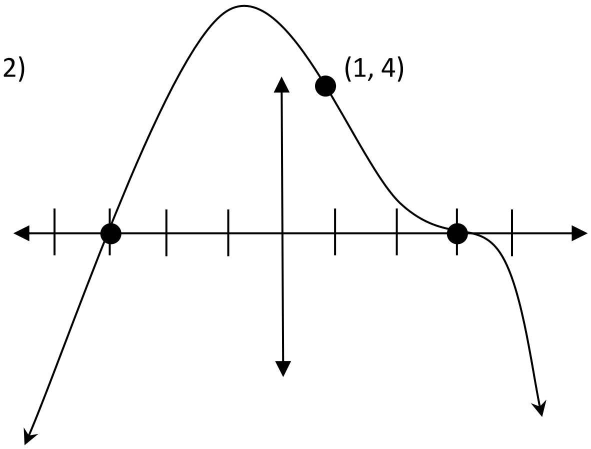
1)



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

Use sign analysis, plug in (-5) to see if the graph is correct.

2)



y = $-(x + 3)(x - 3)^3$

Using sign analysis at (-4) shows the graph to be correct only if the negative sign is added to the equation.

Now, for the graph from #2, using the given coordinates (1, 4), come up with the exact equation.

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

$4 = a(1 + 3)(1 - 3)^3$ plug in (1, 4)

$4 = a(4)(-2)^3$

$4 = a(4)(-8)$

$4 = -32a$

$a = -1/8$

$y = -1/8(x + 3)(x - 3)^3$

Homework: pg66-68 21-24, 27-32