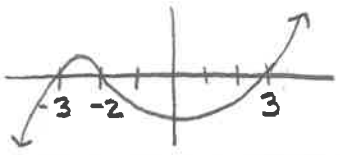
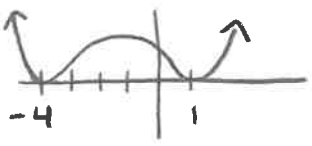
Steps to graphing a polynomial function:

1. End Behavior

	Description	Example
a. Positive and Even Degree	$x \to -\infty \quad f(x) \to \infty$ $x \to \infty \quad f(x) \to \infty$ 	$f(x) = 3x^4 - 2x + 1$ $f(x) = 2x^6 + 3x^4 - 5x$
b. Positive and Odd Degree	$x \to -\infty \quad f(x) \to -\infty$ $x \to \infty \quad f(x) \to \infty$ 	$f(x) = 5x^3 + 3x - 2$ $f(x) = 4x^7 + 1$
c. Negative and Even Degree (*reflects over x-axis)	$x \to -\infty \quad f(x) \to -\infty$ $x \to \infty \quad f(x) \to -\infty$ 	$f(x) = -x^4 + 3x^2 - 10$ $f(x) = -5x^6$
d. Negative and Odd Degree (*reflects over x-axis)	$x \to -\infty \quad f(x) \to \infty$ $x \to \infty \quad f(x) \to -\infty$ 	$f(x) = -2x^5 - 5x^2$ $f(x) = -x^{13} + 4$

2. X-intercepts → factor and evaluate when $y = 0$

Behavior		
	Description	Example
Odd Degree *degree of * factor	crosses x-axis 	$f(x) = (x+2)(x^2 - 9)$
Even Degree	bounces off x-axis 	$f(x) = (x-1)^2 (x+4)^2$ *double root* $x = 1$ multiplicity of 2

3. Y-intercept → set $x = 0$ and evaulate

Graph:

I. $f(x) = 2x(x-3)(x+2)$

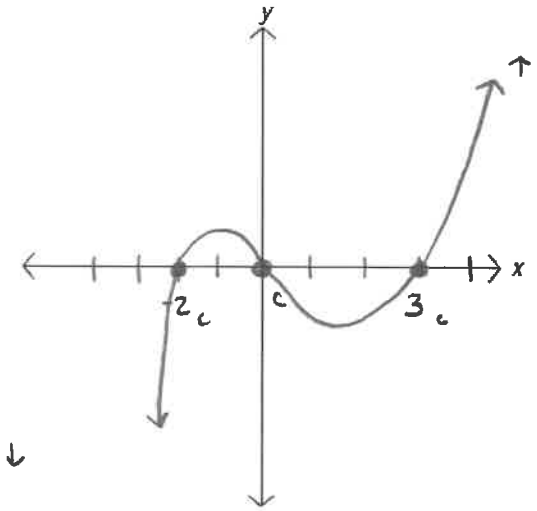
1) pos and odd ↓ ↑

2) $x = 0$ c $x = 3$ c $x = -2$ c

3) y-int

$f(0) = 0(-3)(2)$

$= 0$ $(0,0)$



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

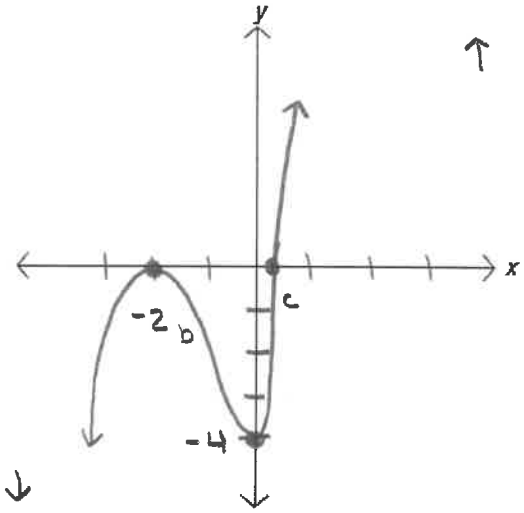
1) pos and odd ↑ ↓

2) $x = 1/3$ c $x = -2$ b

3) $f(0) = (-1)(2)^2$

$= -4$

$(0,-4)$



III. $f(x) = x^4 + 4x^3 + x^2 - 6x$ * factor

$\pm 1, \pm 2, \pm 3, \pm 6$ / ± 1

1) pos and even ↑ ↑

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

-1	1	4	1	-6
		-1	-3	2
	1	3	-2	0

1	1	4	1	-6
		1	5	6
	1	5	6	0

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

$= x(x-1)(x+3)(x+2)$ $x = 0, 1, -3, -2$

cross

3) y-int $(0,0)$