3.4 Part 2 New

Wednesday, June 28, 2023 1:29 PM

3.4 Equations and Graphs of Polynomial Functions: Part 2

Example 1: For each function: determine the x – intercepts, the degree and end behavior of the graph, the zeroes and their multiplicity, the y – intercept of the graph, intervals where the function is positive and negative. Sketch the function.

a) $f(x) = x(x+3)(x-2)$

x – intercepts

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

$x = 0 \quad x+3=0 \quad x-2=0$

$x = -3 \quad x = 2$

degree and end behavior

degree 3

leading coeff +

down into Quad 3

up into Quad 1

zeroes and multiplicity

All Multiplicity 1

y – intercept

$x = 0$

$y = 0(0+3)(0-2)$

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

$y = 0$

$x = 1 \quad y = 1(1+3)(1-2)$

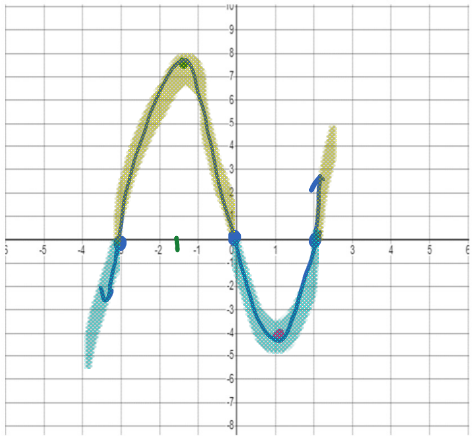
$y = 1(4)(-1)$

$y = -4$ ✱

$x = -1.5 \quad y = -1.5(-1.5+3)(-1.5-2)$ ✱

$y = -1.5(1.5)(-3.5) = 7.875$

Graph



intervals of positive and negative

positive

$-3 < x < 0$

$x > 2$

negative

$x < -3$

$0 < x < 2$

b) $g(x) = x^4 + 2x^3 - 3x^2 - 8x - 4$

x – intercepts

$\{\pm 1, \pm 2, \pm 4\}$

$g(-1) = (-1)^4 + 2(-1)^3 - 3(-1)^2 - 8(-1) - 4$

$g(-1) = 1 - 2 - 3 + 8 - 4$

$g(-1) = 0$ $(x+1)$ is a factor

1	1	2	−3	−8	−4
		1	1	−4	−4
	1	1	−4	−4	0

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

$f(x)$

degree and end behavior

degree 4 leading coeff (+) up into Quad ① and ②

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

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

$f(-1) = 0$

$(x+1)$ is a factor

1	1	1	−4	−4
		1	0	−4
	1	0	−4	0

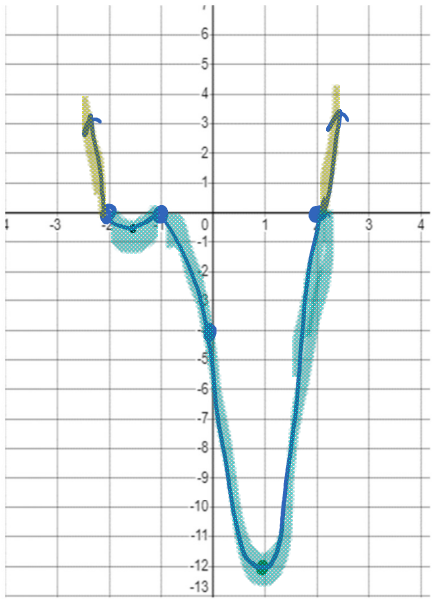
$g(x) = (x+1)^2(1x^2 - 4) = (x+1)^2(x-2)(x+2)$

zeroes and multiplicity

$x = -1$ Mult 2

$x = 2$, $x = -2$ Mult 1

Graph



y – intercept

constant term

or

Make $x = 0$ $y = -4$

$x = -1.5$

$g(-1.5) = (-1.5+1)^2(-1.5-2)(-1.5+2)$

$g(-1.5) = (-.5)^2(-3.5)(.5) = -.4375$

$g(1) = 1 + 2 - 3 - 8 - 4 = -12$

intervals of positive and negative

positive

$x < -2$

$x > 2$

Negative

$-2 < x < -1$

$-1 < x < 2$

or

$-2 < x < 2$ $x \neq -1$

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

x – intercepts

$\{\pm 1, \pm 2, \pm 4\}$

$f(1) = -2 + 6 - 4$

$f(1) = 0$ $(x-1)$ is a factor

1	−2	0	6	−4
		−2	−2	4
	−2	−2	4	0

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

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

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

degree and end behavior

Degree 3

Leading coeff ⊖

up into Quad 2

down into Quad 4

zeroes and multiplicity

$x = 1$ Mult 2

$x = -2$ Mult 1

y – intercept

$y = -4$

$x = -1$

$f(-1) = 2 - 6 - 4$

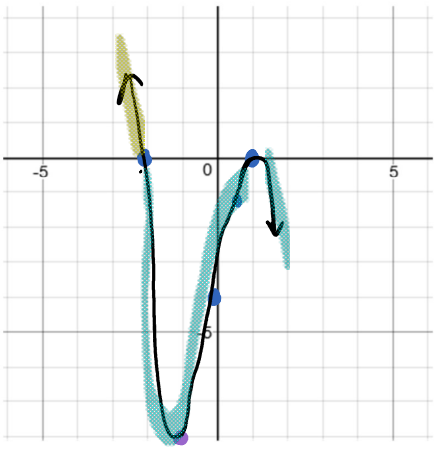
$f(-1) = -8$

$x = .5$

$f(.5) = -2(.5-1)^2(.5+2)$

$= -2(-.5)^2(2.5) = -1.25$

Graph:



Intervals of positive and negative:

positive

$x < -2$

negative

$-2 < x < 1$ $x > 1$

or

$x > -2$ $x \neq 1$

Practice: p.149 #9

Mrs. Shaw

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