Characteristics of Polynomials in Factored Form

Sept 26/2018

Consider a polynomial in the form:

$$g(x) = a(x-p)(x-q)(x-r)$$

factors

The factors of the polynomial can be used to identify the zeroes (or roots, or x-intercepts).

$$set\ g(x) = 0$$

$$0 = a(x-p)(x-q)(x-r)$$

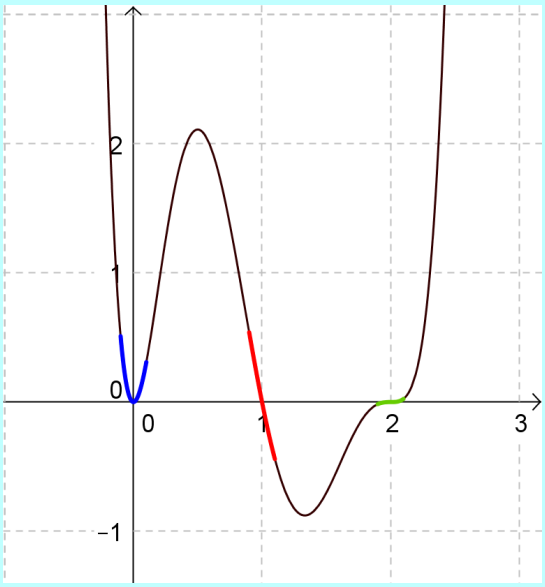
$a \neq 0$, so $x-p=0$ or $x-q=0$ or $x-r=0$

$x = p$ $x = q$ $x = r$

Sep 16-8:34 PM

The order or degree of the factors will determine the behaviour of the graph near the x-axis.

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



Zeroes:

$0 = 5x^2(x-1)(x-2)^3$

$x = 0$

$x = 1$

$x = 2$

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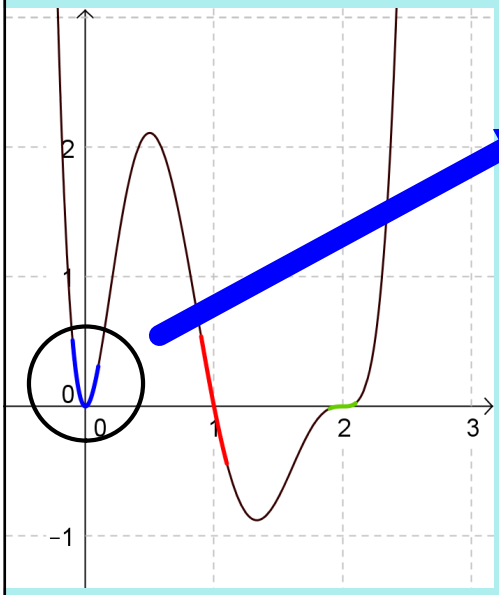

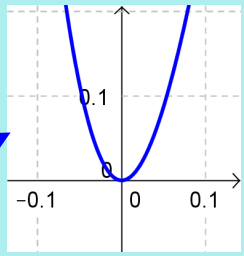

factor: x^2

zero at: $x = 0$

behaviour: quadratic

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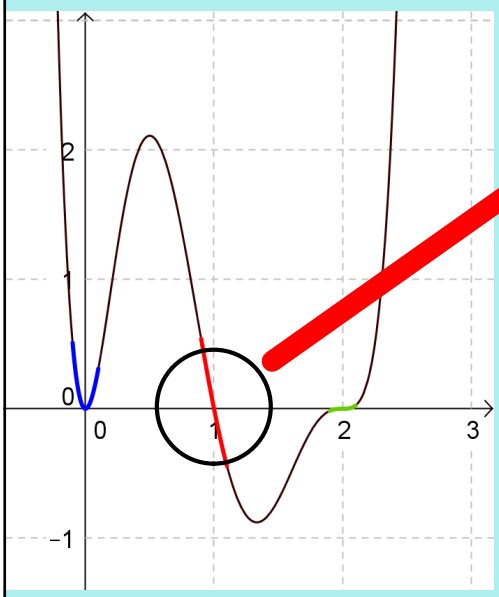
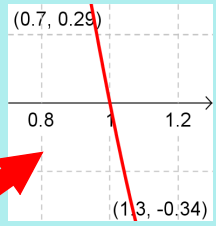
Consider $f(x) = 5x^2(x-1)(x-2)^3$





factor: $(x-1)$

zero at: $x = 1$

behaviour: linear

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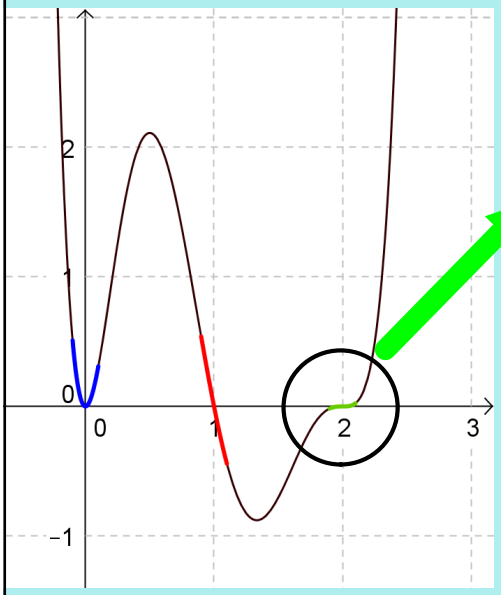
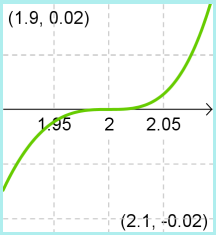
Consider $f(x) = 5x^2(x-1)(x-2)^3$





factor: $(x-2)^3$

zero at: $x = 2$

behaviour: cubic

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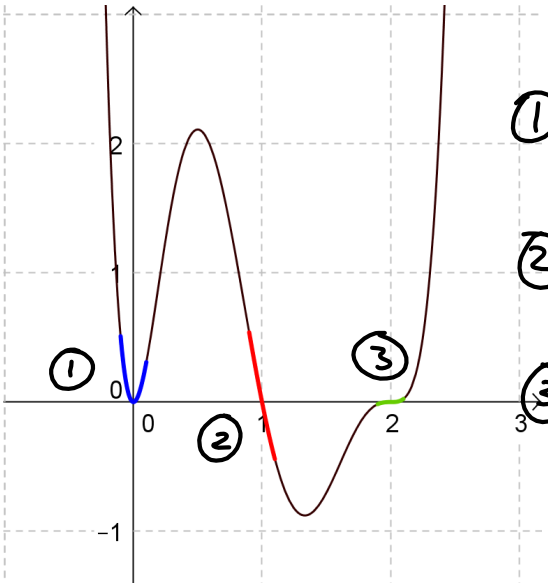
The order or degree of the factors will determine the behaviour of the graph near the x-axis.

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



1. for x=0, factor is quadratic, graph looks like parabola

2. for x=1, factor is linear, graph looks like line

3. for x=2, factor is cubic, graph looks like cubic

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To sketch the graph of a polynomial in factored form:
(1) use leading coefficient and order of polynomial to determine end behaviour,
(2) plot x-intercepts (zeroes) and y-intercepts,
(3) use order of factors to sketch behaviour at x-axis.

To determine the equation in factored form:
(1) substitute zeroes from graph into equation,
(2) determine order of each zero from behaviour of graph near x-axis
(3) substitute another point (not a zero) and solve for the value of a (leading coefficient).

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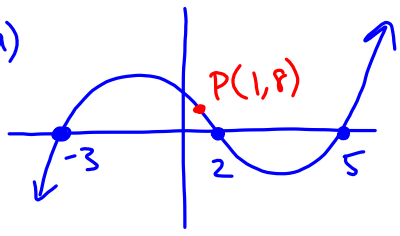
Assigned Work:

p.146 # 1, 2, 4, 6, 9ab, 10, 12, 13, 14 (find k only)

(many of these questions are quick sketches)

4. (a)



$y = \underset{?}{a}(x+3)^1(x-2)^1(x-5)^1$

sub P(1,8)

$8 = a(1+3)(1-2)(1-5)$

$\vdots$

$a = \frac{1}{2}$

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14. $f(x) = kx^3 - 8x^2 - x + 3k + 1$

$(2,0)$ $f(2) = 0$

$0 = k(2)^3 - 8(2)^2 - (2) + 3k + 1$

$0 = 8k - 32 - 2 + 3k + 1$

$33 = 11k$

$k = 3$

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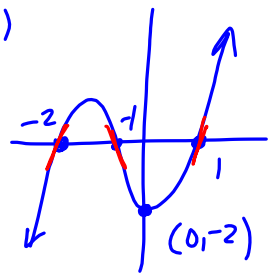
12. (a)



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

sub $(0,-2)$

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

$-2 = a(-2)$

$a = 1$

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