

Review 2.4-2.5

Divide $f(x)$ by $d(x)$. Then write a summary statement in polynomial form and fraction form.

$$f(x) = x^4 - 3x^3 + 6x^2 - 3x + 5 \quad d(x) = x^2 + 1$$

$$\begin{array}{r} x^2 - 3x + 5 \\ \hline x^2 + 1 \end{array} \overbrace{\begin{array}{r} x^4 - 3x^3 + 6x^2 - 3x + 5 \\ -x^4 - x^2 \\ \hline -3x^3 + 5x^2 - 3x + 5 \\ +3x^3 + 3x \\ \hline 5x^2 + 5 \\ -5x^2 - 5 \\ \hline 0 \end{array}}^{(x^2+1)(x^2-3x+5)}$$

Use the factor theorem to determine whether the first polynomial is a factor of the second polynomial.

$x - 3$ ^{yes} and $x^3 - x^2 - x - 15$

$$\begin{array}{r} 3 \\[-0.2ex] \overline{)1 \quad -1 \quad -1 \quad -15} \\[-0.2ex] \quad 3 \quad 6 \quad 15 \\[-0.2ex] \hline \quad 1 \quad 2 \quad 5 \quad \boxed{0} \end{array}$$

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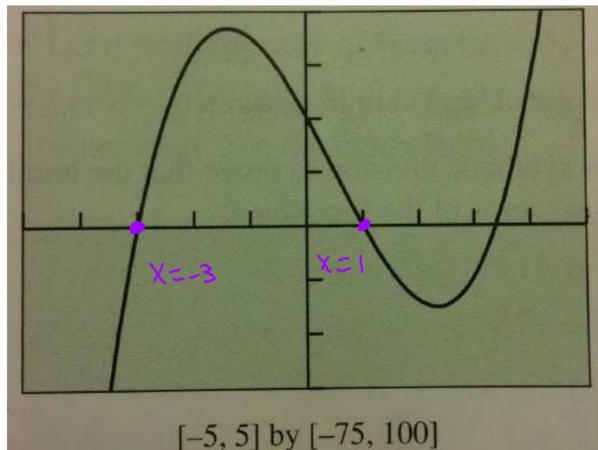
$x - 2$ *not a factor*
and $x^3 + 3x - 4$

$$\begin{array}{r} 2 | & 1 & 0 & 3 & -4 \\ & & 2 & 4 & 14 \\ \hline & 1 & 2 & 7 & \boxed{10} \end{array}$$

Use the graph to guess possible linear factors of $f(x)$. Then completely factor $f(x)$ with the aid of synthetic division.

$$(x+3)(x-1)(5x-17)$$

$$5x^3 - 7x^2 - 49x + 51$$



$$\begin{array}{r} \boxed{1} & 5 & -7 & -49 & 51 \\ & \underline{-3} & & & \\ \hline & 5 & -2 & -51 & \boxed{0} \\ & & \underline{-15} & 51 \\ \hline & 5 & -17 & \boxed{0} \end{array}$$

Using only algebraic methods, find the cubic function with the given table of values

x	-4	0	3	5
y	0	180	0	0



$$y = a(x+4)(x-3)(x-5)$$

$$180 = a(0+4)(0-3)(0-5)$$

$$180 = a(4)(-3)(-5)$$

$$180 = 60a$$

$$3 = a$$

$$y = 3[(x^2 + 1x - 12)(x - 5)]$$

$$y = 3[x^3 + x^2 - 12x - 5x^2 - 5x + 60]$$

$$y = 3[x^3 - 4x^2 - 17x + 60]$$

$$\boxed{y = 3x^3 - 12x^2 - 51x + 180}$$

Find all of the real zeros of the function given that $x = 4$ is a zero.
Identify each zero as rational or irrational.

$$f(x) = x^3 - 6x^2 + 7x + 4$$

$$\begin{array}{r} 4 \\[-1ex] | \quad 1 \quad -6 \quad 7 \quad 4 \\ \quad 4 \quad -8 \quad -4 \\ \hline \quad 1 \quad -2 \quad -1 \quad \boxed{0} \end{array}$$

$$x^2 - 2x - 1$$

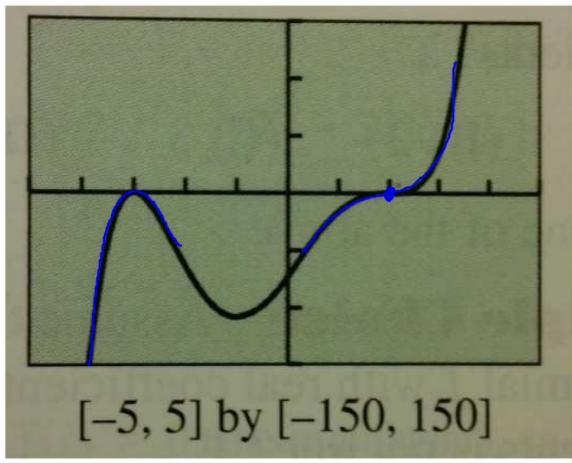
$$(x-4)(x^2-2x-1)$$

$$a=1 \ b=-2 \ c=-1$$

$$x = \frac{2}{2} \pm \frac{\sqrt{4+4}}{2}$$

$$x = 1 \pm \frac{\sqrt{8}}{2}$$
 irrational

Determine the zeros and multiplicity from the graph below



$$x = -3 \quad (\text{mult} = 2)$$

$$x = 2 \quad (\text{mult} = 3)$$

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

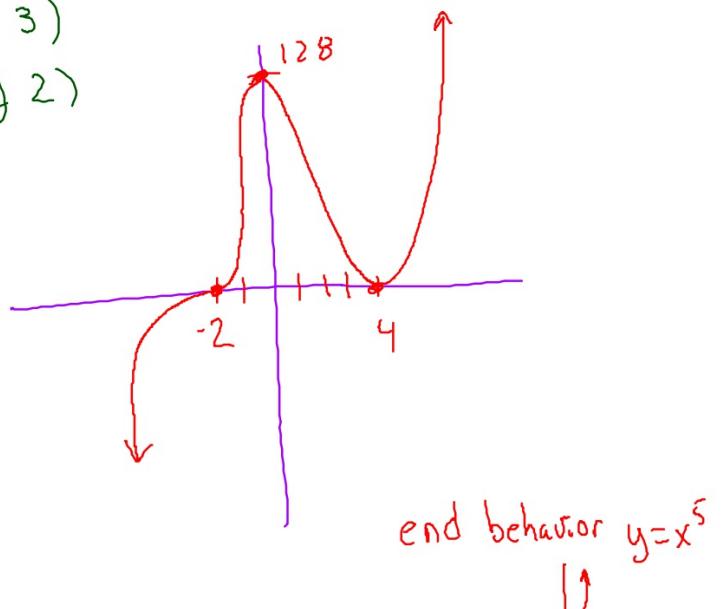
Given the zeros and multiplicity from write the equation of the function in factored form. Then sketch a graph of the function.

$$x = -2 \text{ (multiplicity of 3)}$$

$$x = 4 \text{ (multiplicity of 2)}$$

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

$$\begin{aligned} y \text{ int } &\rightarrow y = (2)^3 (-4)^2 \\ (x=0) &= 8(16) \\ &= 128 \end{aligned}$$



Find the polynomial function with leading coefficient 2 that has the given degree and zeros

Degree: 3, with 2, 1/2, and 3/2 as zeros

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

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

$$y = 4x^3 - 10x^2 + 4x - 6x^2 + 15x - 6$$

$$y = 4x^3 - 16x^2 + 19x - 6 \quad \text{Leading coefficient } 4$$

$$P(x) = 2x^3 - 8x^2 + \frac{19}{2}x - 3$$