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Leading coefficient of 4 $x(3x)(3x)$ $9x^3$ $\frac{9(\text{what})}{9} = \frac{4}{9}$	Find the polynomial function with leading coefficient 4 that has the given degree and zeros. A) Degree 3, with 2, -1, and 4 as zeros $x^2+1x-2x-2$ $f(x) = 4(x-2)(x+1)(x-4) \rightarrow (4x-8)(x-2)(x-4)$ $f(x) = 4[(x^2-1x-2)(x-4)]$ $= 4[x^3-x^2-2x-4x^2+4x+8]$ $= 4[x^3-5x^2+2x+8]$ $\boxed{= 4x^3-20x^2+8x+32}$ B) Degree 3 with 5, 1/3, and 2/3 as zeros $x=5$, $-5\ -5$, $x-5=0$, $(x-5)$ $(3)\,x=\frac{1}{3}(3)$, $3x=1$, $-1\ -1$, $(3x-1)=0$ $x=\frac{2}{3}$ $\boxed{f(x)=\frac{4}{9}(x-5)(3x-1)(3x-2)}$

what $= \frac{4}{9}$

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

x-int x-int x-int

x	-4	0	3	5
f(x)	0	180	0	0

y-int

y-int

$(4)(-3)(-5) = 60$

$60(\text{what}) = 180$

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

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

$\frac{180}{60} = \frac{60a}{60}$

$a = 3$

$\boxed{y = 3(x+4)(x-3)(x-5)}$

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Finding Rational Zeros * 1) List all possible rational zeros p/q where q is the leading coefficient and p is the constant 2) Use your calculator to find the zeros and then use synthetic division and algebra to prove that the zeros that you chose are rational zeros $x = 2, -2, \frac{2}{3}, -\frac{2}{3}$ $\boxed{1}, \cancel{-1}, \frac{1}{3}, -\frac{1}{3}$ Rational #'s	Use the Rational Zeros Theorem to write a list of all potential rational zeros and then determine which ones, if any, are zeros. $\boxed{f(x) = 3x^3 + 4x^2 - 5x - 2}$ $p = -2$: $2, 1, -2, -1$; $q = 3$: $1, 3, -1, -3$ $\frac{p}{q} = \frac{\pm 2}{1}, \frac{\pm 2}{3}, \frac{\pm 1}{1}, \frac{\pm 1}{3}$ Possible zeros $\boxed{x = 1}$ $+1 \rfloor$ 3 4 -5 -2 3 7 2 3 7 2 $\boxed{0}$ $3x^2 + 7x + 2 = 0$ $(3x + 1)(x + 2) = 0$ $x = -\frac{1}{3}$ $x = -2$ Irrational - square roots
$p = 1$ $q = 1$ $\frac{p}{q} = \pm 1$	Use the Rational Zeros Theorem to write a list of all potential rational zeros and then determine which ones, if any, are zeros. $f(x) = x^3 - 3x^2 + 1$ $-1 \rfloor$ 1 -3 0 1 -1 +4 -4 1 -4 +4 No Rational Zeros

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	Find all of the real zeros of the function, finding exact values whenever possible. Identify each zero as rational or irrational. 52. $f(x) = x^3 - 6x^2 + 7x + 4$ $\begin{array}{r\|rrrr} 4 & 1 & -6 & 7 & 4 \\ & & 4 & -8 & -4 \\ \hline & 1 & -2 & -1 & \boxed{0} \end{array}$ $x^2 - 2x - 1 = 0$ $x = \frac{2}{2} \pm \frac{\sqrt{(-2)^2 - 4(1)(-1)}}{2} = \boxed{1 \pm \frac{\sqrt{8}}{2}} = \cancel{1 \pm \sqrt{4}}$ Find all of the real zeros of the function, finding exact values whenever possible. Identify each zero as rational or irrational. $f(x) = 2x^4 - 7x^3 - 8x^2 + 14x + 8$ $\begin{array}{r\|rrrrr} 4 & 2 & -7 & -8 & 14 & 8 \\ & & 8 & 4 & -16 & -8 \\ \hline -\frac{1}{2} & 2 & 1 & -4 & -2 & \boxed{0} \\ & & -1 & 0 & 2 & \\ \hline & 2 & 0 & -4 & \boxed{0} & \end{array}$ $2x^2 - 4 = 0$ $2x^2 = 4$ $x^2 = 2$ $x = \pm\sqrt{2}$ $x = \sqrt{2}, -\sqrt{2}$ Irrational $x = 4, -\frac{1}{2}$ Rational