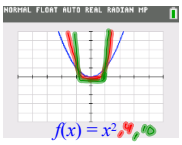
# Advanced Math

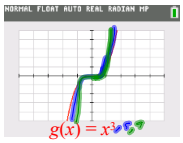
2-2

Polynomials of Higher Degree

Even degree polynomials




Odd degree polynomials




$P(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \ldots + a_mx^{n-m} + \ldots + a_{n-2}x^2 + a_{n-1}x^1 + a_n$

Leading coefficient test (even) -

$a_0$ is positive
both sides increase to $\infty$

$a_0$ is negative
both sides decrease to $-\infty$

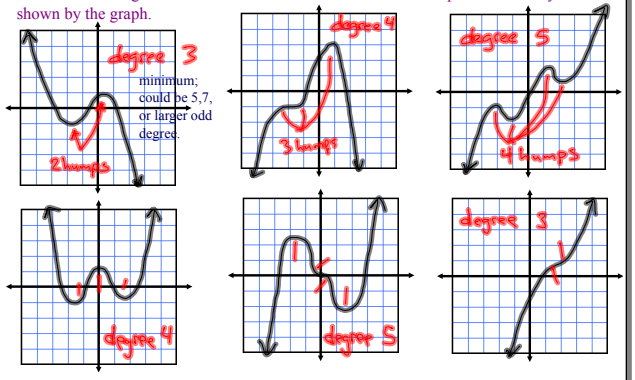
Leading coefficient test (odd) -

$a_0$ is positive:
Left $\to -\infty$
Right $\to \infty$

$a_0$ is negative:
Left $\to \infty$
Right $\to -\infty$

What is the minimum degree of each polynomial?

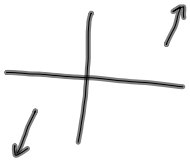
The minimum degree will be one more than the number of "humps" or concavity switches shown by the graph.




Determine the right and left hand behavior of the graph of each polynomial.

13) $f(x) = \frac{1}{3}x^3 + 5x$

Left $\to -\infty$
Right $\to \infty$



21) $h(t) = -\frac{2}{3}(t^2 - 5t + 3)$

Left $\to -\infty$
Right $\to -\infty$

Find all the real zeros of each function.

33) $f(x) = 3x^2 - 12x + 3$

$x = \frac{12 \pm \sqrt{144 - 4(3)(3)}}{2(3)}$

$\{3.732, .268\}$

35) $f(t) = t^3 - 4t^2 + 4t$

$0 = t(t^2 - 4t + 4)$

$0 = t(t-2)(t-2)$

$\{0, 2\}$ (double root)

Find a polynomial function with the given zeros.

55) $\{1 \pm \sqrt{3}\}$

$x = 1 + \sqrt{3}$ $\quad x = 1 - \sqrt{3}$

$f(x) = (x - 1 - \sqrt{3})(x - 1 + \sqrt{3})$

$f(x) = x^2 - x + x\sqrt{3} - x + 1 - \sqrt{3} - x\sqrt{3} + \sqrt{3} - 3$

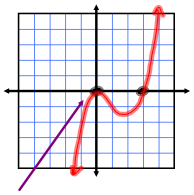
$f(x) = x^2 - 2x - 2$

Sketch the graph of eah function. (List all intercepts.)

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

x-ints: $0 = x^2(x-3)$ $\{0, 3\}$ (double root)

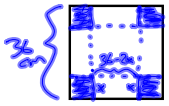
y-ints: (0,0)



The double root will be an *x*-intercept and a max or min.

79) An open box is to be made from a square piece of material, 36 cm on a side, by cutting equal squares from the corners and turning up the sides.

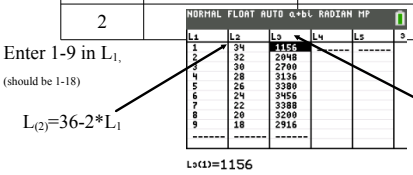
a) Draw a figure to represent this scenario.




b) Use a graphing calculator to complete rows of the chart shown.

| Height | Width | Volume |
|---|---|---|
| 1=x | 36-2x | $V = x(36-2x)^2$ |
| 2 | | |

(0, 18)




Enter 1-9 in $L_1$,

(should be 1-18)

$L_{(2)} = 36 - 2*L_1$

$L_{(3)} = L_1 * L_2^2$

c) Write the volume of the box as a function of the height.

$V = x(36-2x)^2$

d) What size square corner results in the maximum volume of the box.

Assignment:
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1 - 8 all,
14 - 22 even,
28 - 42 even,
48 - 56 even,
62 - 72 even,
80 - 83 all