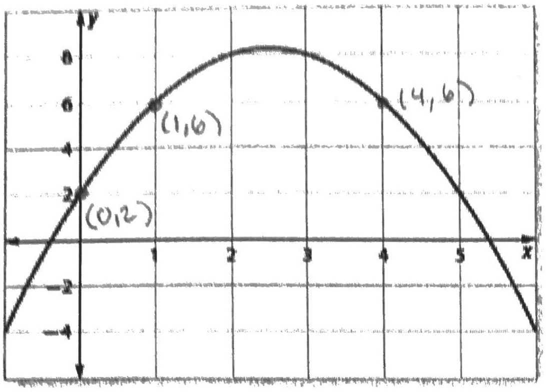
1 In Parts a–d, use a curve-fitting tool and/or algebraic reasoning to find rules for functions $f(x)$, $g(x)$, $h(x)$, and $j(x)$ that model the given graph patterns. In each case, report the graph points used as the basis of your curve-fitting, the rule of the modeling function, and your reasons for choosing a model of that type.

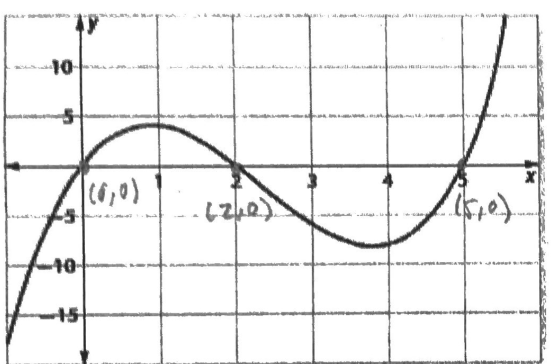
a.



quadratic regression

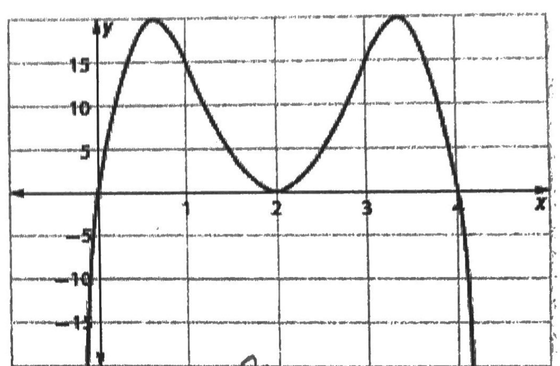
$y = -x^2 + 5x + 2$

b.



$x(x-2)(x-5)$

c.



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

2 Next, consider the function $q(x) = x(x - 3)(x + 5)$.

a. What are the zeroes of $q(x)$? $x = 0$ $x = 3$ $x = -5$

b. Use reasoning like what you apply with products of two linear factors to write a rule for $q(x)$ in standard polynomial form. Record steps in your work so that someone else could check your reasoning.

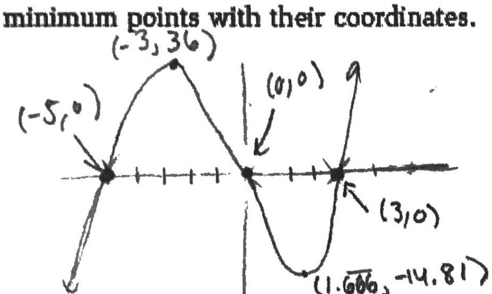
$(x^2 - 3x)(x + 5)$

$x^3 + 5x^2 - 3x^2 - 15x$

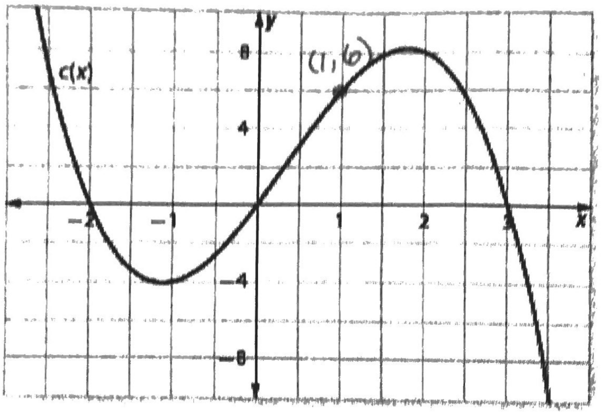
$x^3 + 2x^2 - 15x$

c. Identify the degree of $q(x)$. How could you have predicted that property of the polynomial before any algebraic multiplication? 3; three x's

d. Graph $q(x)$ and label the x-intercepts, y-intercept, and local maximum and local minimum points with their coordinates.



3 The graph below is that of a cubic polynomial $c(x)$.



a. Use information from the graph to write a possible rule for c(x). Express the rule in equivalent factored and standard polynomial forms.

$-x(x+2)(x-3)$
$(-x^2-2x)(x-3)$
$-x^3+3x^2-2x^2+6x$
$-x^3+x^2+6x$

b. Compare the overall shape of the graph, the local max/min points, and intercepts of the graph produced by your rule to the given graph. Adjust the rule if needed to give a better fit.

$y=-ax(x+2)(x-3)$
$6=-a(1)(1+2)(1-3)$
$6=-a(3)(-2)$
$6=6a \quad \underline{a=1}$

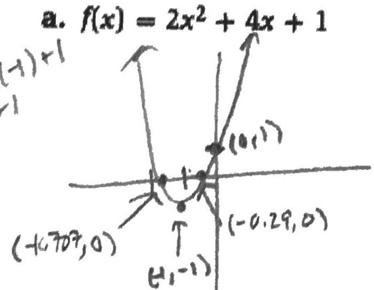
Do not need to adjust rule.

4 Graph each function and then calculate or estimate coordinates of all:

- local maximum points.
- local minimum points.
- *x*-intercepts.
- *y*-intercepts.

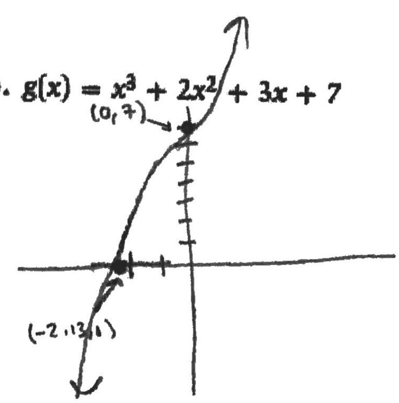
$x=\frac{-4}{2(2)}=-1$
$2(-1)^2+4(-1)+1$
$2-4+1$
-1

a. $f(x) = 2x^2 + 4x + 1$

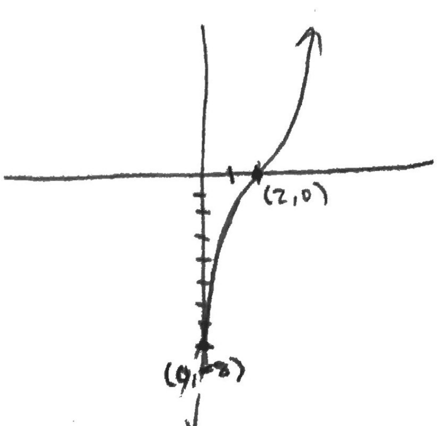


$x=\frac{-4\pm\sqrt{(4)^2-4(2)(1)}}{2(2)}$
$x=\frac{-4\pm\sqrt{8}}{4}$
$x=\frac{-4\pm2\sqrt{2}}{4}$
$x=-1\pm\frac{\sqrt{2}}{2}=-0.29$
≈ -1.707

b. $g(x) = x^3 + 2x^2 + 3x + 7$



c. $h(x) = x^3 - 6x^2 + 12x - 8$



d. $s(x) = x^4 - 8x^3 + 20x^2 - 16x$