Precalculus Unit 1 worksheet: Graphing polynomial functions

Name _____ Date _____ Period _____

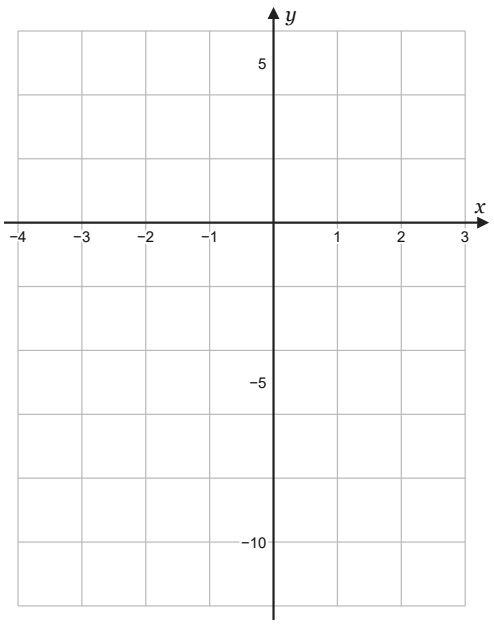
1. Let $g(x) = -\frac{1}{4}x^3(x+3)(x-2)$.

(a) List the zeros of g with their multiplicities, and say what the graph does at each one.

(b) Give the degree and the end behavior of g, and the y-intercept of its graph.

(c) Give the sign of $g(x)$ on each interval between the zeros, and find $g(-2)$, $g(-1)$ and $g(1)$.

(d) Sketch the graph. Degree 5 allows four turning points. How many does your sketch have, and why is the zero at 0 not one of them?



2. Let $p(x) = x^4 - 3x^3 + 5x^2 - 15x$.

(a) Factor $p(x)$ completely over the real numbers.

(b) Give the zeros and what the graph does at each, the end behavior, the y-intercept and the sign of $p(x)$ on each interval between the zeros.

(c) Find $p(-1)$, $p(2)$ and $p(4)$, and sketch the graph.

(d) Degree 4 allows three turning points. How many does your sketch find? Can the sketch alone promise there are no others?

3. Let $p(x) = x^5 - 10x^3 + 9x$.

(a) Factor $p(x)$ completely.

(b) Give the zeros, the end behavior and the sign of $p(x)$ on each interval between the zeros. Find $p(-2)$, $p(2)$ and $p\left(\frac{1}{2}\right)$.

(c) List the peaks and valleys of the graph by interval, and explain why it has no others.

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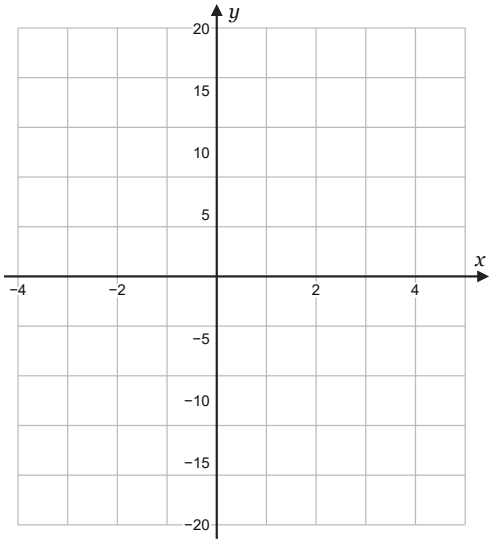
4. The numbers 1 and 3 are zeros of $p(x) = x^4 - 9x^2 - 4x + 12$.

(a) Factor $p(x)$ completely.

(b) Give each zero with its multiplicity, and what the graph does there.

(c) Give the end behavior, the y-intercept and the sign of $p(x)$ on each interval between the zeros. Find $p(-1)$ and $p(2)$.

(d) Sketch the graph. Which of its peaks and valleys does the sketch know exactly, and which only roughly?



5. The polynomial $f(x) = x^4 - 4x^2 + x + 1$ does not factor over the integers, so its zeros cannot be read off.

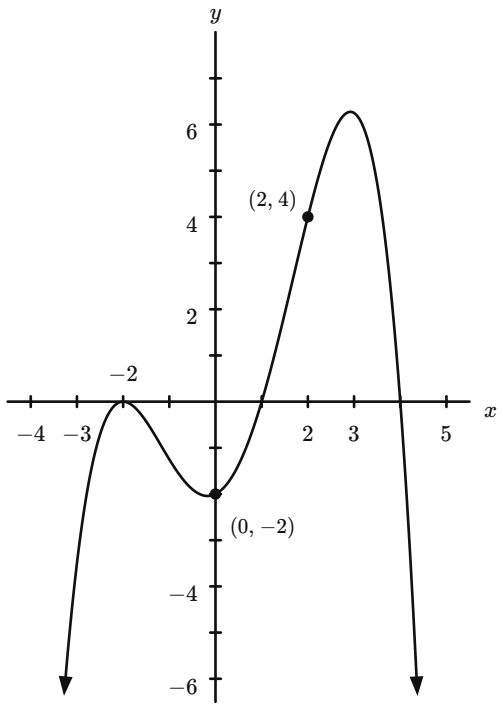
(a) Make a table of $f(x)$ for $x = -3, -2, -1, 0, 1, 2$.

(b) Between which pairs of consecutive integers does f have a zero? Explain why f has exactly four real zeros.

(c) Give the end behavior and the sign of $f(x)$ between its zeros. How many turning points does the graph have, in which intervals, and why can there be no others?

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6. The graph below is a polynomial whose x-intercepts are -2, 1 and 4. It passes through the marked points $(0, -2)$ and $(2, 4)$, and the whole graph is in view apart from its two ends.



(1) $y = -\frac{1}{8}(x+2)(x-1)^2(x-4)$

(2) $y = \frac{1}{8}(x+2)^2(x-1)(4-x)$

(3) $y = -\frac{1}{8}(x+2)^2(x-1)^3(x-4)$

(4) $y = \frac{1}{8}(x+2)^2(x-1)(x-4)$

Which rule is the graph? For each of the other three, name a feature of the graph it gets wrong, and show the work.

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