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Part B. More on polynomials

1. Construct a polynomial $f(x)$ with real coefficients that has the following properties:

- The degree of $f(x)$ is 5.
- The graph of $f(x)$ is tangent to the x -axis at $x = -2$.
- $f(0) = 0$, $f(1) = 4$, and $f(i) = 0$.

Write your answer in standard form, $f(x) = ax^5 + bx^4 + \dots$.

2. Describe a sequence of geometric transformations that would transform the graph of the power function $y = x^4$ into the graph of the function $y = -\frac{1}{2}(3x+1)^4$.

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Part C. Rational functions

1. Let $f(x) = \frac{x^4 + 3x}{3x^2 - 27}$.

- a. Find all discontinuities of the graph of $f(x)$. For each discontinuity, name the x -coordinate and identify the type of discontinuity.

- b. Find a polynomial function that approximates the *end behavior* of $f(x)$.
(In other words, find an *end behavior asymptote* or *end behavior model*.)

- c. Sketch a graph of $f(x)$ that correctly shows the discontinuities and end behavior.

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2. Find the dimensions of a metal can that holds 237 cm^3 (that's the same as 8 ounces) of juice and uses the least amount of metal. You may make these simplifying assumptions:

- The can is a circular cylinder, capped at both ends.
- The can will be filled all the way to the top.
- The metal will have the same thickness everywhere, so thickness can be ignored.