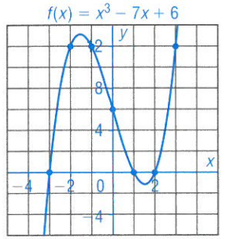
B

6. Use a table of values to sketch the graph of each polynomial function.

a) $f(x) = x^3 - 7x + 6$

The equation represents an odd-degree polynomial function. The leading coefficient is positive, so as $x \to -\infty$, the graph falls and as $x \to \infty$, the graph rises. The constant term is 6, so the y-intercept is 6.

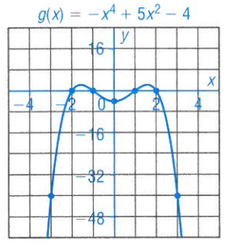
x	$f(x)$
−3	0
−2	12
−1	12
0	6
1	0
2	0
3	12



b) $g(x) = -x^4 + 5x^2 - 4$

The equation represents an even-degree polynomial function. The leading coefficient is negative, so the graph opens down. The constant term is −4, so the y-intercept is −4.

x	$g(x)$
−3	−40
−2	0
−1	0
0	−4
1	0
2	0
3	−40



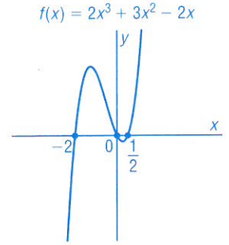
TEACHER NOTE

Achievement Indicator
Question 6 addresses AI 12.6: Sketch, with or without technology, the graph of a polynomial function.

7. Use intercepts to sketch the graph of each polynomial function.

a) $f(x) = 2x^3 + 3x^2 - 2x$

Factor.
$f(x) = x(2x^2 + 3x - 2)$
$f(x) = x(x + 2)(2x - 1)$
Determine the zeros of $f(x)$. Let $f(x) = 0$.
$0 = x(x + 2)(2x - 1)$
The zeros are: $0, -2, \frac{1}{2}$
So, the x-intercepts of the graph are: $0, -2, \frac{1}{2}$
The equation has degree 3, so it is an odd-degree polynomial function.
The leading coefficient is positive, so as $x \to -\infty$, the graph falls and as $x \to \infty$, the graph rises.
The constant term is 0, so the y-intercept is 0.



b) $h(x) = 2x^4 + 7x^3 + 4x^2 - 7x - 6$

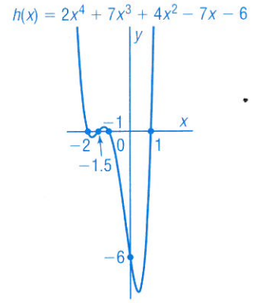
Factor the polynomial. Use the factor theorem.
The factors of the constant term, −6, are: 1, −1, 2, −2, 3, −3, 6, −6
Use mental math to substitute $x = 1$, then $x = -1$ in $h(x)$ to determine that both $x - 1$ and $x + 1$ are factors.
Divide by $x - 1$.

1	2	7	4	−7	−6
		2	9	13	6
	2	9	13	6	0

So, $2x^4 + 7x^3 + 4x^2 - 7x - 6 = (x - 1)(2x^3 + 9x^2 + 13x + 6)$
Divide $2x^3 + 9x^2 + 13x + 6$ by $x + 1$.

−1	2	9	13	6
		−2	−7	−6
	2	7	6	0

So, $2x^4 + 7x^3 + 4x^2 - 7x - 6 = (x - 1)(x + 1)(2x^2 + 7x + 6)$
Factor the trinomial: $2x^2 + 7x + 6 = (2x + 3)(x + 2)$
So, $2x^4 + 7x^3 + 4x^2 - 7x - 6 = (x - 1)(x + 1)(2x + 3)(x + 2)$
Determine the zeros of $h(x)$. Let $h(x) = 0$.
$0 = (x - 1)(x + 1)(2x + 3)(x + 2)$
The zeros are: 1, −1, −1.5, −2
So, the x-intercepts of the graph are: 1, −1, −1.5, −2
The equation has degree 4, so it is an even-degree polynomial function.
The leading coefficient is positive, so the graph opens up. The constant term is −6, so the y-intercept is −6.



TEACHER NOTE

Achievement Indicators
Question 7 addresses
AI 11.2: Divide a polynomial expression by a binomial expression of the form $x - a$, $a \in I$, using long division or synthetic division.
AI 11.5: Explain and apply the factor theorem to express a polynomial expression as a product of factors.
AI 12.5: Explain how the multiplicity of a zero of a polynomial function affects the graph.
AI 12.6: Sketch, with or without technology, the graph of a polynomial function.