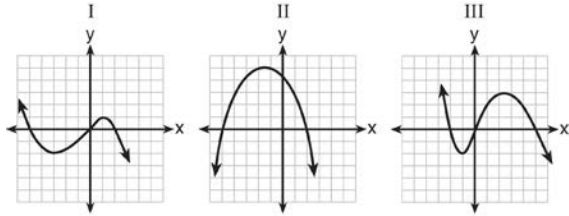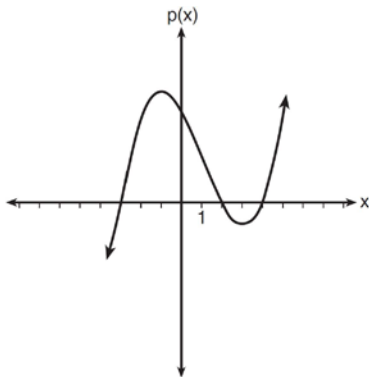## A.APR.B.3: Graphing Polynomial Functions

1 A polynomial function contains the factors x, $x - 2$, and $x + 5$. Which graph(s) below could represent the graph of this function?
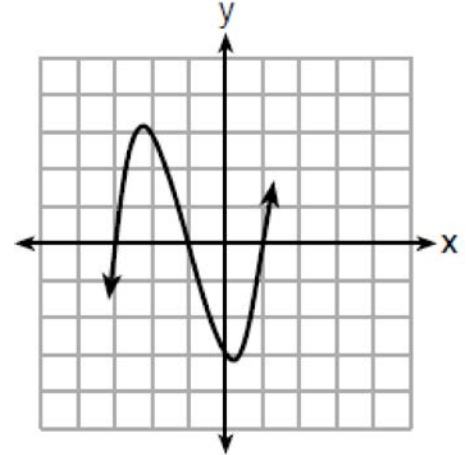

1) I, only
2) II, only
3) I and III
4) I, II, and III

2 Based on the graph below, which expression is a possible factorization of $p(x)$?

1) $(x + 3)(x - 2)(x - 4)$
2) $(x - 3)(x + 2)(x + 4)$
3) $(x + 3)(x - 5)(x - 2)(x - 4)$
4) $(x - 3)(x + 5)(x + 2)(x + 4)$
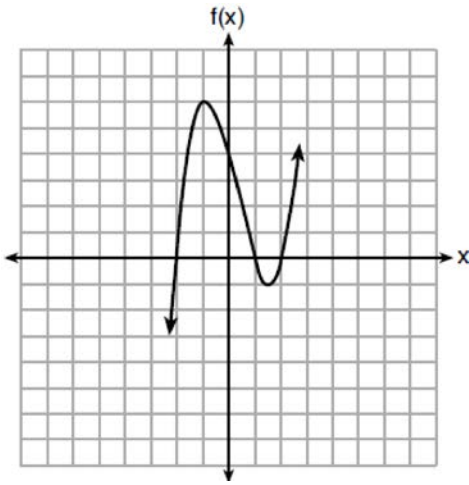
3 A cubic function is graphed on the set of axes below.

Which function could represent this graph?
1) $f(x) = (x - 3)(x - 1)(x + 1)$
2) $g(x) = (x + 3)(x + 1)(x - 1)$
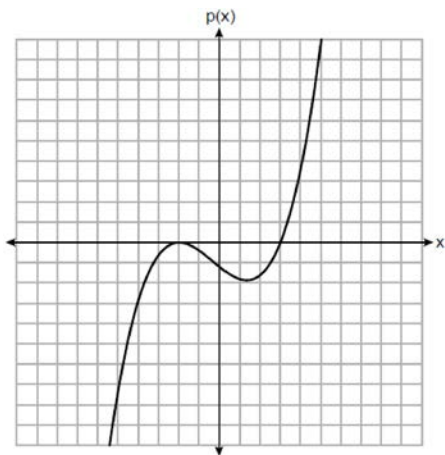3) $h(x) = (x - 3)(x - 1)(x + 3)$
4) $k(x) = (x + 3)(x + 1)(x - 3)$

4 A polynomial function is graphed below.

f(x)

Which function could represent this graph?
1) $f(x) = (x+1)(x^2+2)$
2) $f(x) = (x-1)(x^2-2)$
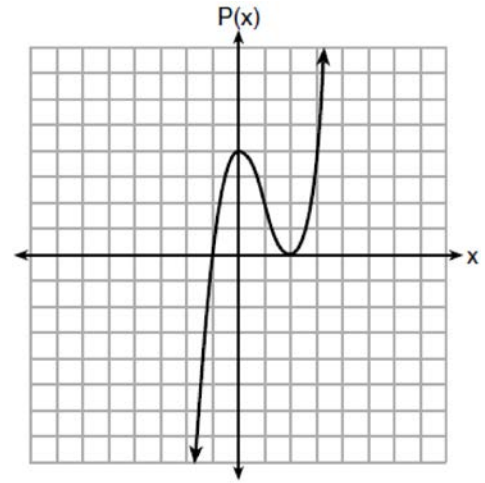3) $f(x) = (x-1)(x^2-4)$
4) $f(x) = (x+1)(x^2+4)$

5 The graph of a cubic polynomial function $p(x)$ is shown below.

p(x)

If $p(x)$ is written as a product of linear factors, which factor would appear twice?
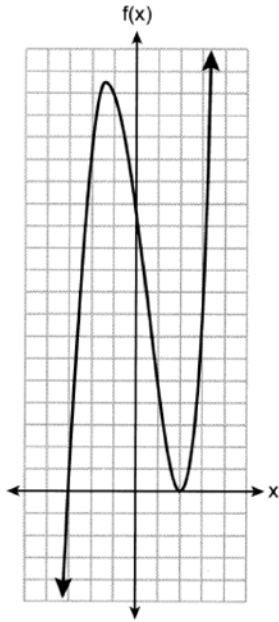1) $x-2$
2) $x+2$
3) $x-3$
4) $x+3$

6 Wenona sketched the polynomial $P(x)$ as shown on the axes below.

P(x)

Which equation could represent $P(x)$?
1) $P(x) = (x+1)(x-2)^2$
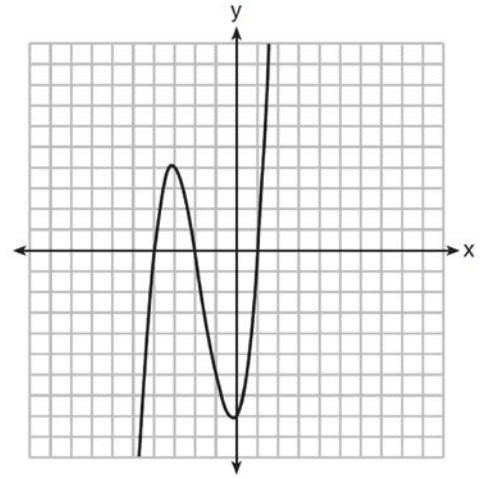2) $P(x) = (x-1)(x+2)^2$
3) $P(x) = (x+1)(x-2)$
4) $P(x) = (x-1)(x+2)$

7 A function is graphed below.

f(x)

A possible equation for this function is
1) $f(x) = (x+2)(x-3)$
2) $f(x) = (x-2)(x+3)$
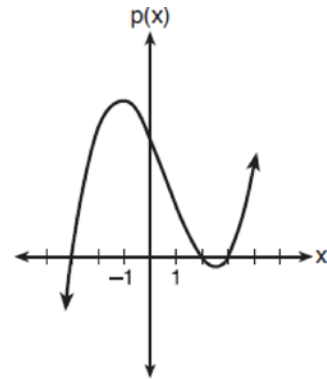3) $f(x) = (x-2)^2(x+3)$
4) $f(x) = (x-2)(x+3)(x-12)$

8 The graph of $f(x)$ is shown below.

y

Which function could represent the graph of $f(x)$?
1) $f(x) = (x+2)(x^2+3x-4)$
2) $f(x) = (x-2)(x^2+3x-4)$
3) $f(x) = (x+2)(x^2+3x+4)$
4) $f(x) = (x-2)(x^2+3x+4)$

9 The graph of the function $p(x)$ is sketched below.

p(x)
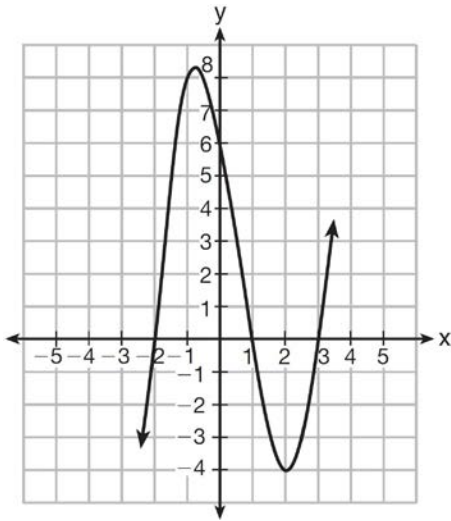

Which equation could represent $p(x)$?
1) $p(x) = (x^2-9)(x-2)$
2) $p(x) = x^3 - 2x^2 + 9x + 18$
3) $p(x) = (x^2+9)(x-2)$
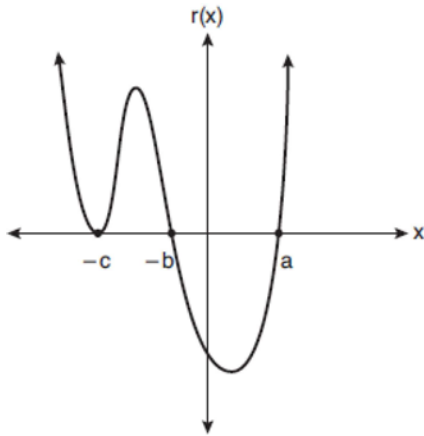4) $p(x) = x^3 + 2x^2 - 9x - 18$

10 Which equation(s) represent the graph below?

   I $y = (x + 2)(x^2 - 4x - 12)$

   II $y = (x - 3)(x^2 + x - 2)$

   III $y = (x - 1)(x^2 - 5x - 6)$

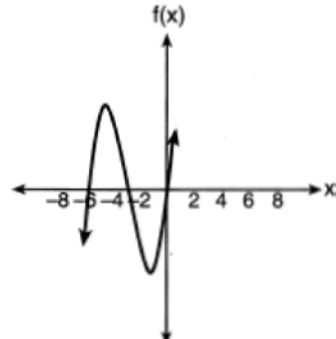1)   I, only
2)   II, only
3)   I and II
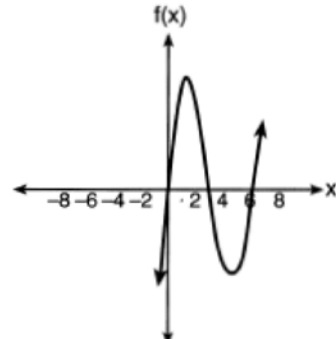4)   II and III

11 A sketch of $r(x)$ is shown below.

An equation for $r(x)$ could be
1) $r(x) = (x - a)(x + b)(x + c)$
2) $r(x) = (x + a)(x - b)(x - c)^2$
3) $r(x) = (x + a)(x - b)(x - c)$
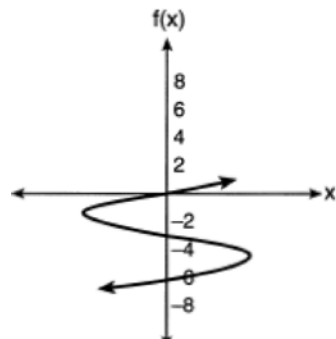4) $r(x) = (x - a)(x + b)(x + c)^2$

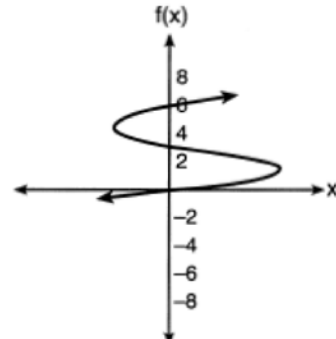12 Which sketch represents the polynomial function $f(x) = x(x + 6)(x + 3)$?

1)
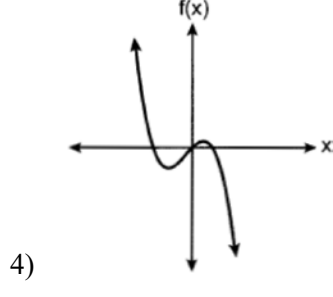

2)

3)

4)

13 Which graph best represents the graph of
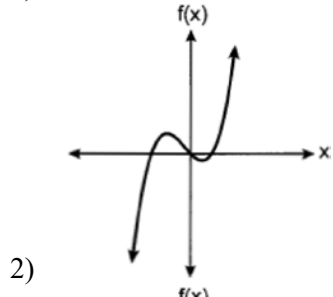$f(x) = (x + a)^2(x - b)$, where a and b are positive
real numbers?

1)

2)

3)

4)
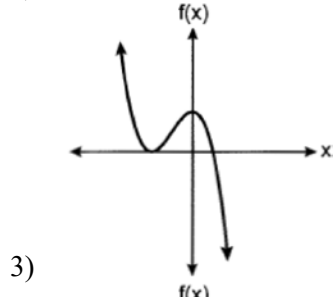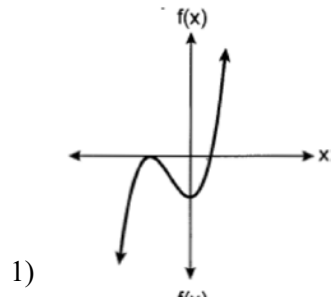
14 Which graph represents a polynomial function that
contains $x^2 + 2x + 1$ as a factor?

1)

2)

3)

4)
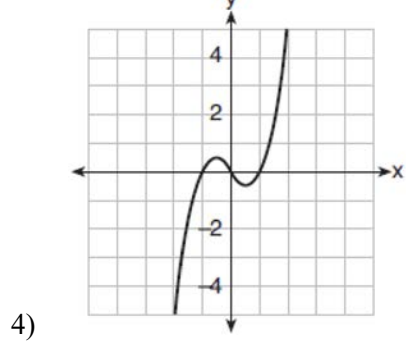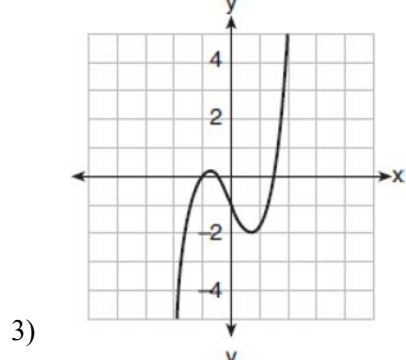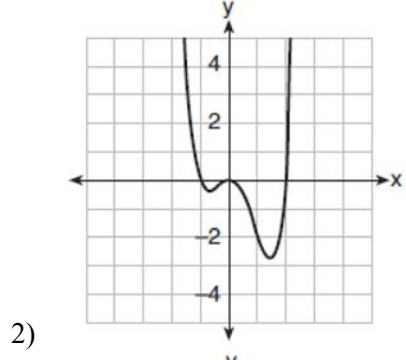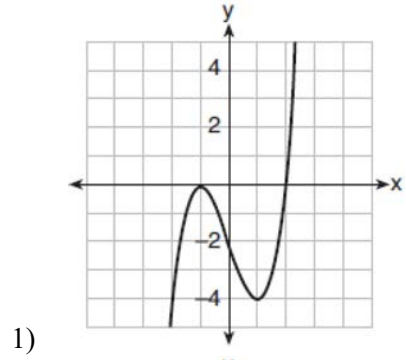
15 If a, b, and c are all positive real numbers, which graph could represent the sketch of the graph of $p(x) = -a(x + b)\left(x^2 - 2cx + c^2\right)$?

1)

2)

3)
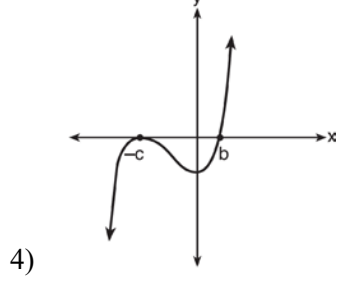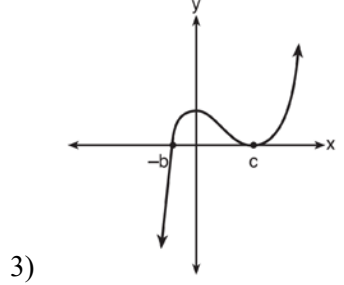
4)
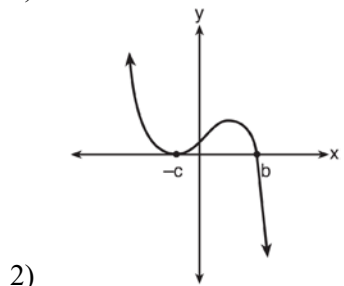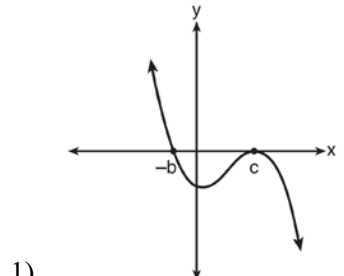
16 On the axes below, sketch a possible function $p(x) = (x - a)(x - b)(x + c)$, where a, b, and c are positive, $a > b$, and $p(x)$ has a positive y-intercept of d. Label all intercepts.
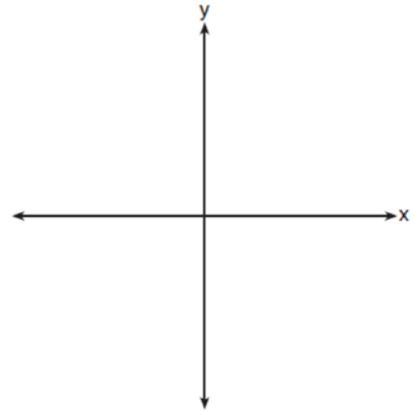
A.APR.B.3: Graphing Polynomial Functions
Answer Section

1 ANS: 1   REF: 011524ai
2 ANS: 1   REF: 081623ai
3 ANS: 2   REF: 061818ai
4 ANS: 3

$f(x) = (x - 1)(x^2 - 4) = (x - 1)(x - 2)(x + 2)$

REF: 061908ai
5 ANS: 2   REF: 082324aii
6 ANS: 1   REF: 081707ai
7 ANS: 3   REF: 062310ai
8 ANS: 1

$f(x) = (x + 2)(x + 4)(x - 1)$

REF: 081504ai
9 ANS: 1   REF: 061701aii
10 ANS: 2

$y = (x - 3)(x + 2)(x - 1)$

REF: 061512ai
11 ANS: 4   REF: 061921aii
12 ANS: 1

The zeros of f are -6, -3 and 0.

REF: 062112ai
13 ANS: 1   REF: 012405aii
14 ANS: 1
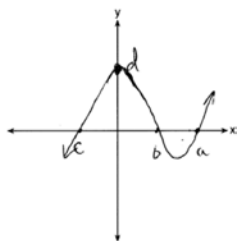
$x^2 + 2x + 1 = (x + 1)^2$

REF: 011919aii
15 ANS: 1

The zeros of the polynomial are at $-b$, and c. The sketch of a polynomial of degree 3 with a negative leading coefficient should have end behavior showing as x goes to negative infinity, $f(x)$ goes to positive infinity. The multiplicities of the roots are correctly represented in the graph.

REF: spr1501aii

16 ANS:

REF: 081732aii