Name: _____ **Period:** _____ **Date:** _____ **ID: A**

PreCalc 12 Chapter 1 Review 2017 v1

Multiple Choice
Identify the choice that best completes the statement or answers the question.

Easy

____ **1.** Divide: $(4x^2 - 49y^2) \div (2x + 7y)$

A. $2x + 7y$ **B.** $-2x + 7y$ **C.** $2x - 7y$ **D.** $-2x - 7y$

____ **2.** Divide: $(x^2 - 324) \div (x - 18)$

A. $x + 18$ **B.** $-x - 18$ **C.** $-x + 18$ **D.** $x - 18$

____ **3.** Which of these statements are always true for the division of a polynomial by a binomial?
i) The degree of the remainder is less than that of the divisor.
ii) For synthetic division, the variables are removed and only the coefficients are recorded.
iii) For synthetic division, the coefficients are listed in ascending order of the powers of the variable.
iv) The product of the constant terms of the divisor and the quotient equals the constant term of the dividend.

A. ii and iv
B. i, iii, and iv
C. i and ii
D. i, ii, and iii

____ **4.** Determine the remainder when $2x^3 + 3x^2 - 7x + 8$ is divided by $x + 2$.

A. 18 **B.** –2 **C.** 12 **D.** –50

____ **5.** What polynomial has $x + 5$ as a factor?

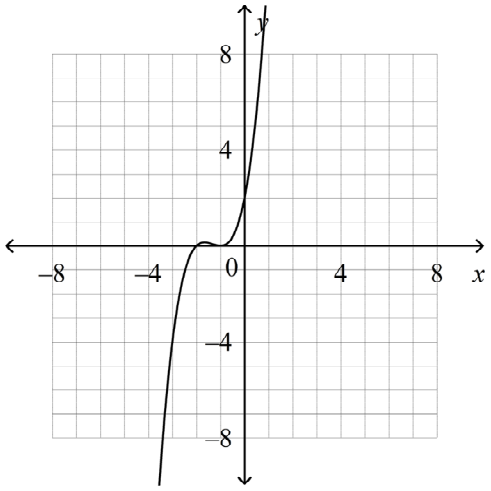
A. $x^3 - 7x^2 - 12x + 37$
B. $x^3 - 7x^2 - 23x + 185$
C. $x^3 - 7x^2 - 23x$
D. $x^3 - 12x^2 + 37x$

____ **6.** What integer values of a should be chosen to test for binomial factors of the form $x - a$ of the polynomial $x^3 - x^2 + 2x + 9$?

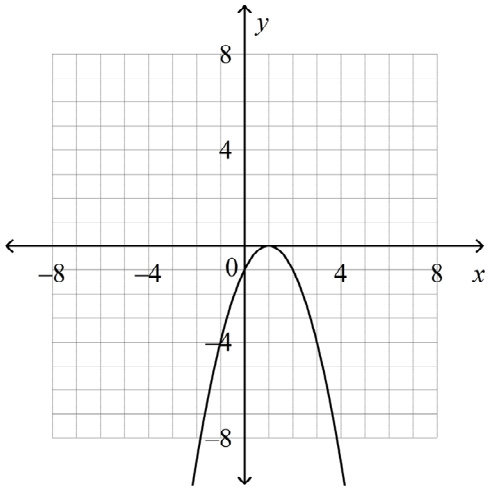
A. –9, –1, 1, 9
B. 1, 3, 9
C. 1, 2, 9
D. –9, –3, –1, 1, 3, 9

____ **7.** Identify the graph that corresponds to the function $f(x) = x^3 + 4x^2 + 5x + 2$.

A.



C.



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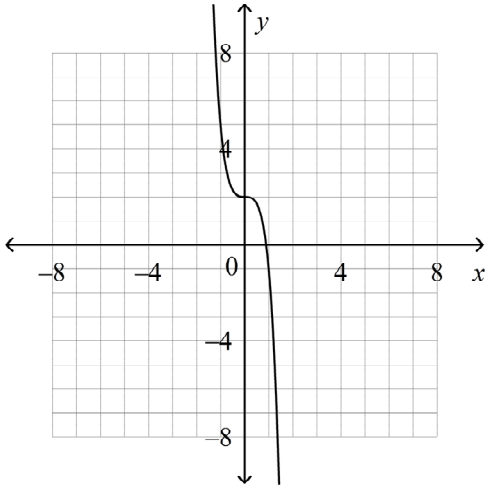

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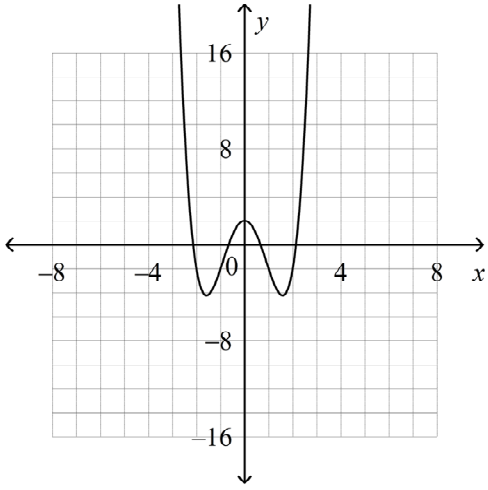


____ **8.** For the polynomial $P(x) = -3x^2 - 4x - 5$, what is the value of $P(-2)$?

A. –25 **B.** 15 **C.** –21 **D.** –9

____ **9.** Use graphing technology. Graph the polynomial function $f(x) = x^3 - 7x^2 + 11x - 5$. Which characteristics apply to the graph?

A. Number of *x*-intercepts: 3
Number of hills: 1
Number of valleys: 1

B. Number of *x*-intercepts: 2
Number of hills: 2
Number of valleys: 1

C. Number of *x*-intercepts: 2
Number of hills: 1
Number of valleys: 1

D. Number of *x*-intercepts: 1
Number of hills: 1
Number of valleys: 2

____ **10.** What type of polynomial function is $f(x) = -2x^5 - 3x^4 - 3x^2 + 6$?

A. cubic
B. quadratic
C. quartic
D. quintic

____ **11.** Use a graphing calculator to graph the function $V(x) = x^3 - 7x^2 + 10x$. Determine the coordinates of the local maximum point to the nearest tenth.

A. (0.9, 8.2) **B.** (3.8, 4.1) **C.** (3.8, 8.2) **D.** (0.9, 4.1)

____ **12.** Use a graphing calculator to graph the function $f(x) = 3x^3 + 15x^2 - 12x - 60$. Determine the coordinates of the local maximum point to the nearest hundredth.

A. (–3.69, 37.79) **B.** (0.36, –62.24) **C.** (–62.24, 0.36) **D.** (37.79, –3.69)

____ **13.** A box with the shape of a rectangular prism has height x centimetres. Its volume, V cubic centimetres, is represented by the polynomial function $V(x) = x^3 - 13x^2 + 36x$. Determine the maximum volume of the box and the corresponding value of x. Give your answers to the nearest tenth.

A. maximum volume: 42.0 cm^3
height: 6.9 cm
B. maximum volume: 28.6 cm^3
height: 6.9 cm
C. maximum volume: 28.6 cm^3
height: 1.7 cm
D. maximum volume: 42.0 cm^3
height: 1.7 cm

Moderate (Show work for non-MC)

____ **14.** Divide: $(-4x^2 + 22x + 12) \div (x - 6)$

A. $4x + 6$ **B.** $4x - 48$ **C.** $-4x + 12$ **D.** $-4x - 2$

____ **15.** What is the remainder when $x^3 + 4 - 11x + 3x^2$ is divided by $6 + x$?

A. 70 **B.** –62 **C.** –38 **D.** 46

____ **16.** What is the remainder when $x^4 + x^3 - 7x^2 - 2x + 5$ is divided by $x + 4$?

A. 93 **B.** –4 **C.** 33 **D.** 419

____ **17.** Which statements are always true for both the graphs of cubic functions and the graphs of quintic functions?
i) The graphs have an odd number of x-intercepts.
ii) The graphs never have equal numbers of hills and valleys.
iii) The values of the constant terms in the equations are the y-intercepts of the graphs.
iv) When the terms with the greatest degree in the equations are negative, the graphs rise to the left and fall to the right.

A. iii, iv **B.** i, ii, iv **C.** i, iv **D.** i, ii, iii

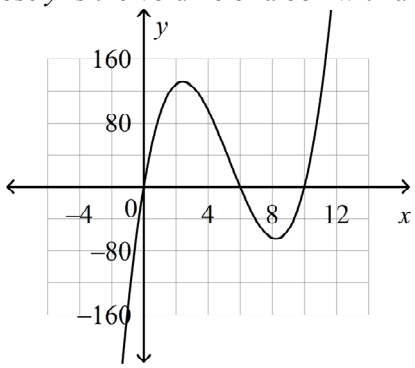
____ **18.** When $x^4 + x^3 - 12x^2 + 41x + q$ is divided by $x + 5$, the remainder is 0. What is the value of q?

A. 5 **B.** 9 **C.** 39 **D.** –28

____ **19.** What are two binomials factors of $x^4 + x^3 - 49x^2 - 169x - 120$?

A. x+ 3 and – 5
B. x– 3 and x– 5
C. x– 3 and x+ 5
D. x+ 3 and x+ 5

____ **20.** Here is the graph of $y = 2x(10 - x)(6 - x)$. Suppose y is the volume of a box with a top. The box is made from a piece of cardboard 20 cm long and 12 cm wide. Squares of side length x centimetres are cut from the corners of the cardboard to make a net for the box.



Which statements are correct?
i) The minimum volume is approximately 65 cm^3.
ii) The maximum volume is approximately 131 cm^3.
iii) The volume is 0 when x is approximately 8.2 cm.
iv) The maximum volume occurs when x is approximately 2.4 cm.

A. i, ii, iii **B.** i, ii, iv **C.** iii, iv **D.** ii, iv

____ **21.** A rectangular prism has dimensions x centimetres, $(9 - x)$ centimetres, and $(11 - x)$ centimetres. Determine the maximum volume of the prism to the nearest tenth of a cubic centimetre.

A. 144.8 cm^3 **B.** 145.8 cm^3 **C.** 36.1 cm^3 **D.** 140.8 cm^3

____ **22.** A carton of juice in the shape of a rectangular prism has dimensions 5.2 cm by 5.2 cm by 9.4 cm. The manufacturer wants to design a carton with double the capacity by increasing each dimension by x centimetres. What equation could be used to determine the value of x?

A. $508.352 = (5.2 - x)^2(9.4 - x)$
B. $254.176 = (5.2 + x)^2(9.4 + x)$
C. $508.352 = (5.2 + x)^2(9.4 + x)$
D. $254.176 = (5.2 - x)^2(9.4 - x)$

Difficult (Show work for non-MC)

____ **23.** Divide: $(4x^3 - 16x^2 + 18x - 28) \div (-x + 3)$

A. $-4x^2 + 4x - 6$ R10
B. $-4x^2 + 4x - 6$ R(–10)
C. $4x^2 - 4x + 6$ R(–10)
D. $4x^2 - 4x + 6$ R10

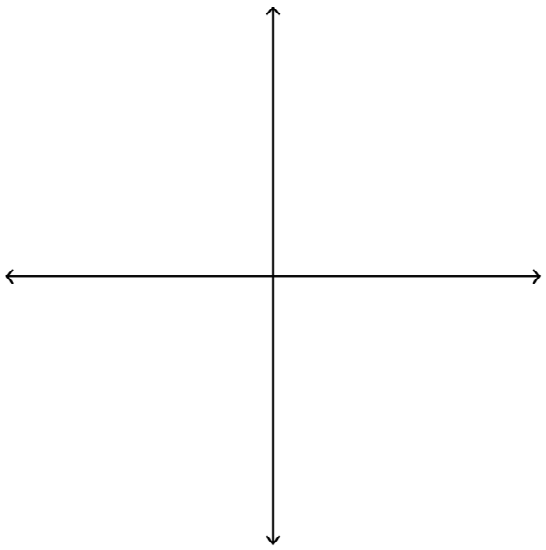
____ **24.** The volume of a shipping box with the shapeof a rectangular prism can be expressed as the polynomial $2x^3 + 11x^2 + 17x + 6$. Each dimension of the box can be expressed as a binomial. Which binomial could represent one dimension of the box?

A. $2x + 1$ **B.** $x + 1$ **C.** $2x + 3$ **D.** $x + 6$

Short Answer

Easy

25. The graph of the function $h(x) = x^3 + 5x^2 + 2x - 8$ has x-intercepts 1, –2, and –4. Sketch a graph of the function. Label all intercepts.



26. When $2x^2 - 7x + 104$ is divided by $x - 1$ using synthetic division, the result is: 2 -5 99
Write the division statement.

27. When $5x^4 - 19x^2 - 9x + 32$ is divided by $x + 2$ using synthetic division, the result is: 5 -10 1 -11 54
Write the quotient and the remainder.

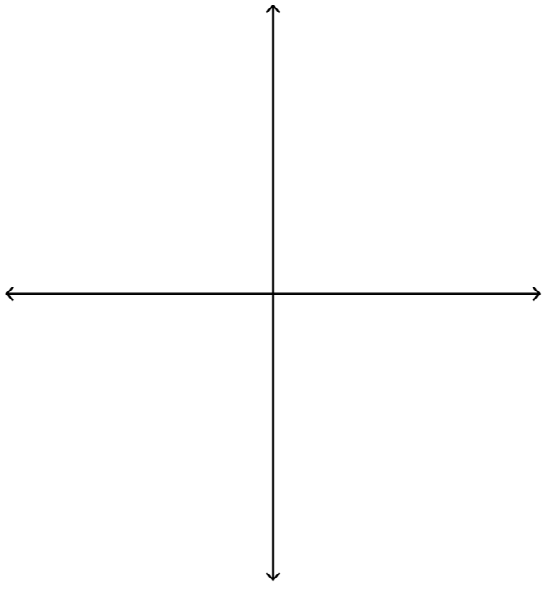
28. When $-5x^5 - 9x^4 + 57x^3 - 118x^2 + x$ is divided by $x + 5$ using synthetic division, the result is:
-5 16 -23 -3 16 -80
Write the quotient and the remainder.

29. Graph the polynomial function $f(x) = -2x^3 + 5x^2 + 2x - 5$ using graphing technology. Complete the table for the graph.

Number of *x*-intercepts	**Number of hills**	**Number of valleys**	***y*-intercept**

Moderate (Show work for non-MC)

30. The zeros of the polynomial function $f(x) = x^4 - 3x^3 - 7x^2 + 15x + 18$ are -1, -2, and 3.
The zeros -1 and -2 have multiplicity 1. The zero 3 has multiplicity 2.
Sketch a graph of the function. Label all intercepts.

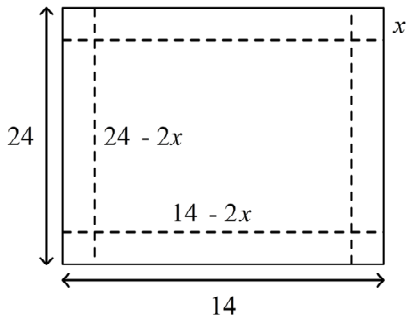


31. Determine one binomial factor of $x^4 - 2x^3 - 17x^2 + 18x - 40$. List possible factors.

32. Determine one binomial factor of $3x^3 - 13x^2 + 13x - 3$. List possible factors.

33. A rectangular piece of metal with dimensions 14 cm by 24 cm is used to make an open box. Equal squares of side length x centimetres are cut from the corners and the sides are folded up. A polynomial function that represents the volume, V, of the box is: $V(x) = x(14 - 2x)(24 - 2x)$

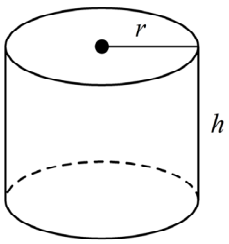
Determine the maximum volume of the box. What is the side length of the square that should be cut to create a box with this volume? Give your answers to the nearest tenth.



Difficult (Show work for non-MC)

34. A manufacturer designs a cylindrical can with no top. The surface area of the can is 275 cm^2. The can has base radius r centimetres and height h centimetres. A polynomial function that represents the capacity, C, of the can is: $C(r) = \dfrac{275r - \pi r^3}{2}$

Determine the radius and height of the can when it has a maximum capacity. Give the answer to the nearest tenth.



Problem

Moderate (Show work for non-MC)

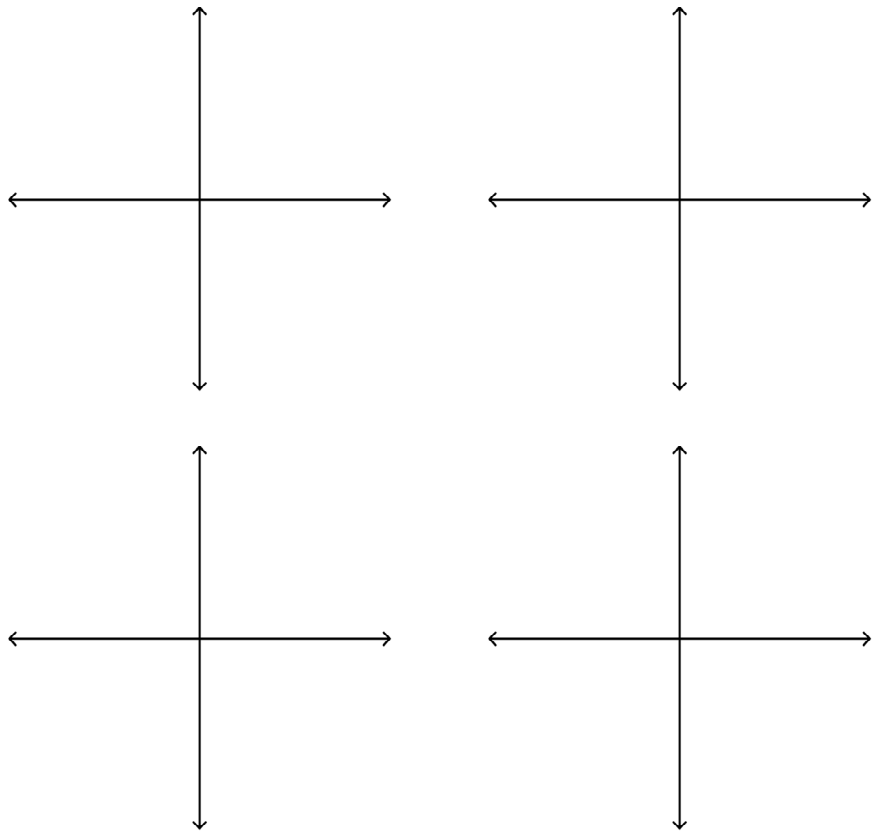
35. a) Use graphing technology. Graph each polynomial function, then sketch its graph.

i) $f(x) = -x^5 + x^4 + x^2 + 1$

ii) $g(x) = x^5 + x^4 - 2x^3 - 2x^2 + x + 1$

iii) $h(x) = -2x^5 + 8x^3 + 4x^2 - 6x - 4$

iv) $j(x) = x^5 - 3x^4 - 5x^3 + 15x^2 + 4x - 12$



b) Complete the table below for the graphs in part a.

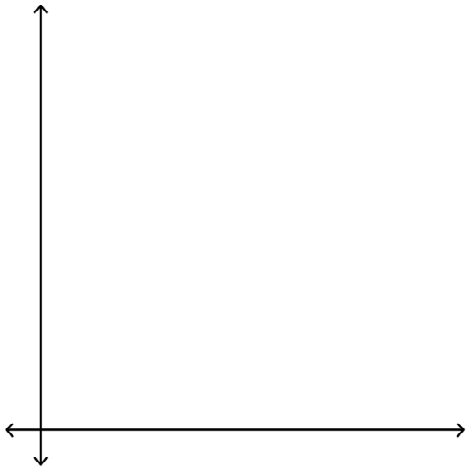
Graph	**Number of *x*-intercepts**	**Number of hills**	**Number of valleys**	***y*-intercept**
i				
ii				
iii				
iv				

36. Here is a student's solution for determining the remainder when $x^3 - 4x^2 + 6x - 2$ is divided by $x + 2$. Identify the error, then write the correct solution.

Let $P(x) = x^3 - 4x^2 + 6x - 2$
When $P(x)$ is divided by $x + 2$, the remainder is $P(2)$.
$P(2) = (2)^3 - 4(2)^2 + 6(2) - 2$
$= (8) - 4(4) + 6(2) - 2$
$= 8 - 16 + 12 - 2$
$= 2$
The remainder is 2.

37. The volume, in cubic centimetres, of an expandable box can be represented by the polynomial function $V(x) = x^3 - 43x^2 + 432x$. The width of the box in centimetres is $16 - x$. Assume the length is greater than the width.

a) Determine binomial expressions for the height and width of the box in terms of x.
b) Graph the function. Sketch the graph. What do the x-intercepts represent?
c) To the nearest cubic centimetre, what is the maximum volume of the box?



38. Cheryl and Gina are twins. They were born 3 years before their younger brother, Ben. This year, the product of their three ages is 4809 greater than the sum of their ages. How old are the twins? Show your work.

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39. Kara and 3 friends each have birthdays on January 9. Leon is 4 years older than Kara, Max is 3 years younger than Kara, and Norma is 5 years younger than Kara. On January 9, 2011, the product of their ages was 59 912 greater than the sum of their ages. How old was Kara and each friend on that day? Show your work.

Difficult (Show work for non-MC)

40. Write a division statement for $-6x^4 + 10x - 25x^2 - 31 + 25x^3$ divided by $2x - 5$.

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41. Use intercepts to sketch the graph of this polynomial function: $f(x) = 2x^4 - 7x^3 - 2x^2 + 13x + 6$
Label all intercepts. Use factor property and list all possible factors.