Name : ________________________

MHF4U1
Unit 1: Polynomial Functions

Total

/45

K/U	APP	COM	TH

KNOWLEDGE/UNDERSTANDING

Multiple Choice

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

____ 1. The restriction on the degree 'n' for all polynomial functions of the form $f(x) = a_nx^n + a_{n-1}x^{n-1}+\cdots+a_1x^1+a_0x^0$ is: [1K]

a. 'n' must be non-negative
b. $n \in \{0, 1, 2, 3, 4,\ldots\}$
c. 'n' must be a whole number
d. All of the above

____ 2. Which function does not classify as a polynomial function? [1K]

a. $y = -3$
b. $y = 2\sqrt{x}$
c. $y = 2x^2-1$
d. $y = -2x^7$

____ 3. If the leading coefficient of an odd-degree polynomial function is negative, then the function extends from: [1K]

a. 1st quadrant → 3rd quadrant
b. 1st quadrant → 2nd quadrant
c. 2nd quadrant → 4th quadrant
d. 2nd quadrant → 3rd quadrant

____ 4. The degree 'n' of a polynomial provides information about all of the following except: [1K]

a. The shape of the graph
b. The end behaviours of the graph
c. The roots of the graph
d. All of the above

____ 5. Which polynomial function has its end behaviour extending from quadrants 1→2? [1K]

a. $f(x) = 7x^5 - 8x^4 - 2x^3 + x^2 + 3x - 2$
b. $f(x) = -4x^2 + 3x^4 - 6x^3 + 2x + 8$
c. $f(x) = -6x^3 + 3x^2 + x - 11$
d. $f(x) = x^3 - 9$

____ 6. The graph of an odd-degree polynomial function has at least __?__ root(s) and up to a maximum of __?__roots. [1K]

a. 3, n
b. 0, n-1
c. 1, n-1
d. 1, n

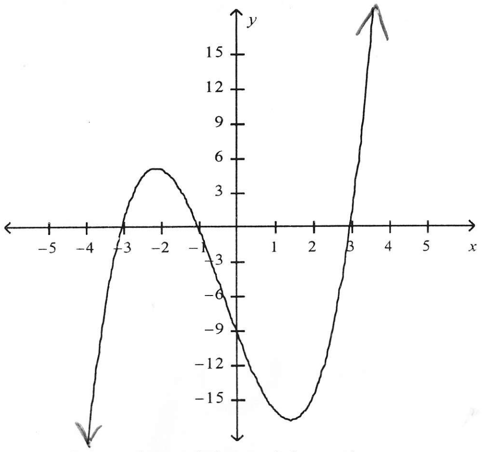
____ 7. The graph of an even degree polynomial function can have at least__?__ root(s) and a maximum of up to__?__ roots.
[1K]

a. 2, n
b. 0, n
c. 0, n-1
d. n, n-1

_____ 8. At "first glance", the polynomial function $f(x) = 3x^4-2x^3+7x^2-1$ provides information about all of the following except: [1K]

a. End behaviours
b. Exact shape of the graph
c. Degree of the function
d. Sign of leading coefficient

____ 9. What is the equation of the graph shown below? [1K]



a. $f(x) = (x-3)(x+1)(x+3)$
b. $f(x) = (x-3)(x-1)(x+3)$
c. $f(x) = (x-3)(x+3)$
d. $f(x) = (x-3)^2(x+1)$

____10. The degree and x-intercepts of the polynomial function $f(x) = x(x+3)^3(x+1)(x-5)$ are: [1K]

a. n=6, x=0, 3 (order 3), -1, -5
b. n=5, x=0, -3 (order 2), -1, -5/2
c. n=5, x=0, -3 (order 3), -1, 5/2
d. n=6, x=0, -3 (order 3), -1, 5

____ 11. The function $h(t) = -4.9t^2 + 120$, where h is in metres and t in seconds, models the following scenario: [1K]

a. A football punt on goal
b. A ball being thrown downward from the roof of a building 120 metres high
c. A cannon being shot upward from the edge of a cliff
d. Releasing a ball from a bridge 120 metres above ground

12. Sketch a possible graph of the functions

a) $y = (x+1)(x-1)(x-5)$

b) $y = x^2(x-3)^3$ [6K]

13. Write an equation of a cubic function that has zeros of -1, 2, and 3. The function has a y-intercept of 6. [3K]

LICATION

This table of values represents a polynomial function f(x). Use **finite differences** to determine the following: [4A]

(a) the degree 'n' of the polynomial function f(x)
(b) the sign of the leading coefficient
(c) the value of the leading coefficient, a_n

X	Y
-3	0
-2	-4
-1	0
0	6
1	8
2	0
3	-24

2. On Earth, the height, h, in metres, of a free falling object after t seconds can be modeled by the function $h(t) = -4.9t^2 + k$, while on Venus, the height can be modeled by $h(t) = -4.45\,t^2 + k$, where $t \geq 0$ and k is the height, in metres, from which the object is dropped. Suppose a rock is dropped from a height of 60 m on each planet. For each planet,

(a) Determine the **average rate of change** of the height of the rock after the first 3 seconds after it is dropped (i.e. $0 \leq t \leq 3$) [2A]
(b) Estimate the **instantaneous rate of change** of the rock 3 seconds after it is dropped (i.e. @ t= 3 sec). Hint: using average rate of change, choose two to three intervals of time that get closer and closer to 3 sec. [4A]
(c) Compare the average rates of change of the falling rock on Earth and on Venus. What do these rates represent, and why are these values different? [2A]

4. Without graphing, determine if each polynomial function has line symmetry about the y-axis, point symmetry about the origin, or neither.
State the type of odd function or even function or neither. [3K]

$f(x) = -x^5 + 7x^3 + 2x$

5.

a). Describe the transformations that must be applied to the graph of each power function, f(x), to obtain the transformed function.
Then, write the corresponding equation. [4K]

b). State the domain and range of the transformed function. For even functions, state the vertex and the equation of the axis of symmetry. [2K]

c). Find the transformed coordinate from f (-2) [2K]

d). Graph and label the transformed function [2K]

$f(x) = x^4$, $y = -5f[2x - 6] + 1$