Exam Unit 5 and Unit 6

Polynomial and Exponential Functions

1 What is the degree of the polynomial $f(x) = 4x^2 - 6x^3 + 7x - 11$?

A) 0
B) 1
C) 2
D) 3

2 What is the leading coefficient of $y = -4x^3 + 6x^2 + 10x + 4$?

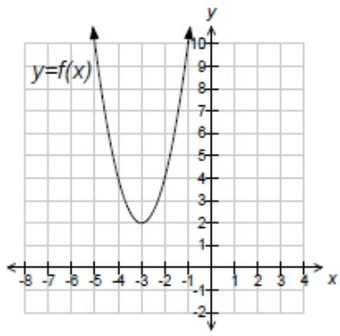
A) cubic
B) -4
C) 4
D) 6

3 Which statement best describes the end behavior of $y = -x^2 + 6x + 7$?

A) rise up through quadrant 2 and falls through quadrant 4
B) falls through quadrant three and rises up through quadrant 1
C) falls through quadrant three and falls through quadrant 4
D) rises through quadrant 2 and rises through quadrant 1

4

What is the range of the function $y = f(x)$ shown in the graph below?



(A) $\{y | y \le -2, y \in R\}$
(B) $\{y | y \ge -2, y \in R\}$
(C) $\{y | y \le 2, y \in R\}$
(D) $\{y | y \ge 2, y \in R\}$

5

What is the *y*-intercept of the graph of the function $f(x) = 4x^3 + x^2 + 2x + 1$?

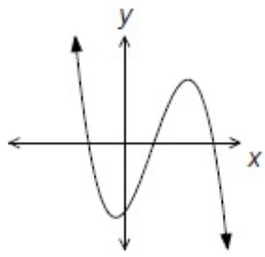
(A) 1
(B) 2
(C) 3
(D) 4

6

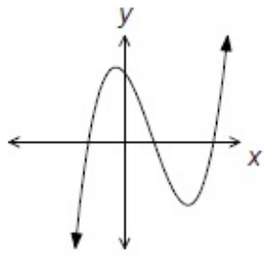
Which graph best represents a function with the characteristics listed below?

- Three x-intercepts
- Extending from Quadrant II to Quadrant IV

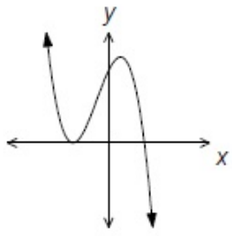
(A)



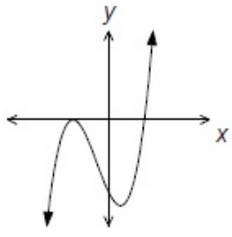
(B)



(C)

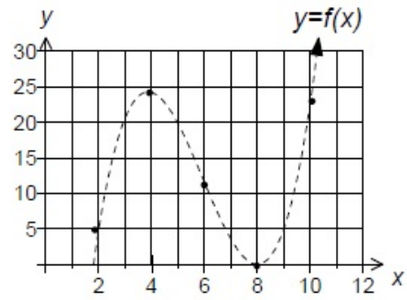


(D)



7 Given the table, the scatter plot and the curve of best fit of the polynomial $f(x)$, what is the value of $f(5)$?

x	y
2	5
4	24
6	12
8	0
10	23



(A) 2
(B) 9
(C) 18
(D) 20

8 From which quadrants does the graph of $f(x) = x^3 + 3x^2 - 4$ extend?

(A) II to I
(B) II to IV
(C) III to I
(D) III to IV

9 Which function passes through the point $(1,-7)$?

(A) $f(x) = -x^3 - 3x^2 + x - 4$
(B) $f(x) = -x^3 - 2x^2 + x - 7$
(C) $f(x) = x^3 + 2x^2 - 4$
(D) $f(x) = x^3 + 3x^2 - 7$

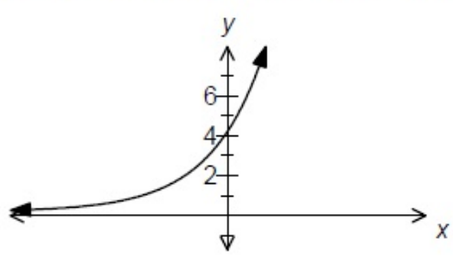
10 Which is a decreasing exponential function?

(A) $f(x) = \frac{1}{3}\left(\frac{5}{2}\right)^x$
(B) $f(x) = 0.5(1.5)^x$
(C) $f(x) = \frac{3}{2}(1)^x$
(D) $f(x) = 2\left(\frac{3}{4}\right)^x$

11 Which is an increasing exponential function ?

A) $y = 4(-2)^x$
B) $y = 6(.89)^x$
C) $y = 24{,}000(1)^x$
D) $y = 24{,}000(2)^x$

12 Which exponential function best represents the graph shown?



(A) $f(x) = \left(\frac{1}{4}\right)^x$
(B) $f(x) = (4)^x$
(C) $f(x) = 4\left(\frac{1}{4}\right)^x$
(D) $f(x) = 4(4)^x$

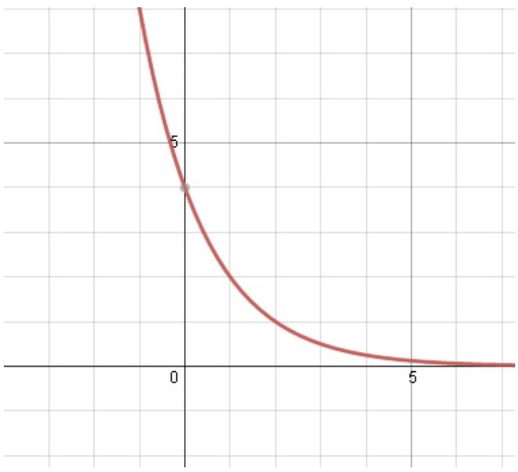
13 Which equation represents the graph shown below?

A) $y = a(b)^x,\ a < 0, b < 0$

B) $y = a(b)^x,\ a > 0, 0 < b < 1$

C) $y = a(b)^x,\ a < 0, 0 < b < 1$

D) $y = a(b)^x,\ a > 0, b > 1$



14 The population of a strain of bacteria growing in a Petri dish is modeled by the function $P(t) = 3000(2)^{\frac{t}{4}}$ where $P(t)$ represents the number of bacteria and t represents the time in hours after the initial count. How much time will it take for the number of bacteria to reach 12 000?

(A) 4 h
(B) 8 h
(C) 16 h
(D) 32 h

15 Solve for x: $4^{x-2} = 2^{x+1}$

A) x = -2
B) x = 0
C) x = 3
D) x = 5

16 Which is true of the table given below?

x (years)	0	3	6	9	12
y (amount)	10	20	40	80	160

	Initial Amount	Amount Growth
(A)	10	doubles every three years
(B)	10	triples every two years
(C)	20	doubles every three years
(D)	20	triples every two years

The function that models the decay of carbon-14 is $A(t) = 100\left(\frac{1}{2}\right)^{\frac{t}{5730}}$, where $A(t)$ is the number of grams of carbon-14 present at time t, in years. Which statement is true?

(A) The amount of carbon-14 doubles every 5730 years.
(B) There are 50 g of carbon-14 present initially.
(C) 14 g will be present after 50 years.
(D) 50 g of carbon-14 will be present after 5730 years.

18 Nora invested $5000compounded semi-annually for 10 years at a rate of 4.8%. Which model will correctly give her value of the investment at the end of 10 years?

A) $y = 5000(1.48)^{10}$

B) $y = 5000(1.048)^{10}$

C) $y = 5000(1.024)^{5}$

D) $y = 5000(1.024)^{20}$

Part II

1 8 marks

Given the function $f(x) = 2x^3 + 5x^2 - 3x - 4$, complete the table to describe its characteristics.

(i)

y-intercept	
end behaviour (left and right)	
Max # of possible *x*-intercepts	

(ii) Explain why the graph of this function is not a parabola.

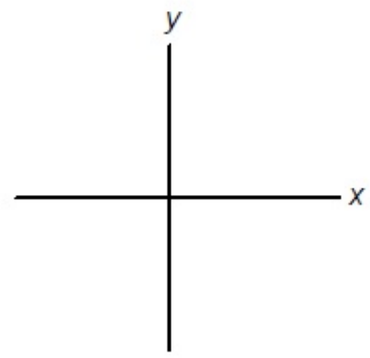
_____

_____

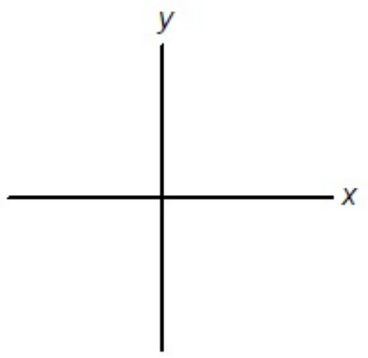
_____

2 Sketch two possible cubic functions that have negative leading coefficients and have positive y-intercepts. Explain with at least two reasons why your graphs are different.
8 marks

Graph 1:



Graph 2:



3 Solve for x ALGEBRAICALLY: $\sqrt{3} = 27^{x+2}$ 6 marks

4 The half-life of Carbon 14 is approximately 5700 years and its decay can be modeled by the function $A(t) = 400\left(\frac{1}{2}\right)^{\frac{t}{5700}}$ where A(t) is the amount present in grams at time t and t is time in years. Algebraically determine how long it will take for it to decay to 50 g. 6 marks

5 Nora is about to invest $5000 in an account that pays 6% interest a year compounded monthly for the next 3 years. A different financial institution offers 6.5% interest a year compounded semi-annually for the next 3 years. Write a function that models the growth of Nora's investment for each situation. Should Nora invest her money in this financial institution instead? Explain why or why not.

8 marks

Investment 1 Investment 2

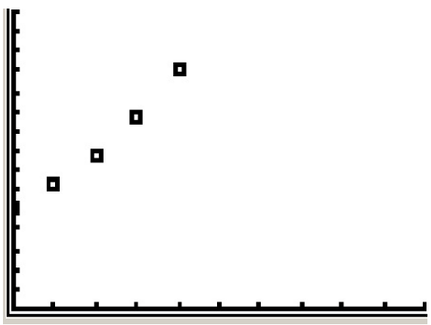
_____

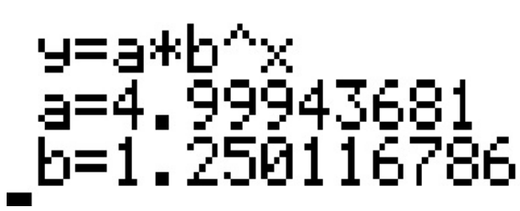
_____

_____

6 Marcus was given the following set of data and asked to construct a scatter plot. He then was asked to fit the scatter plot with an appropriate regression model and determined the information to the right below.

X	0	1	2	3	4
y	5	6.25	7.81	9.77	12.21





A) Which model did he use? Linear, Quadratic, Cubic or Exponential? How do you know?

_____2 marks

B) What is the equation of the model (round to two decimal places)? _____2 marks

C) Use your equation in B to predict what y will be when x is 5? 2 marks

When x = _____ y =_____.

End