Math 1301 - Test #3 Sample **Name:**_____

Date:_____ **Spring 2013** **Student ID:** _____

1a. Write the following expression as an imaginary number: $\sqrt{-49} =$ _____

1b. Perform the operation and write the answer in the $a + bi$ form.

$(2 - i) - (9 - \sqrt{-25}) =$ _____

1c. Perform the operation and write the answer in the $a + bi$ form.

$(2 - i)(9 - 5i) =$ _____

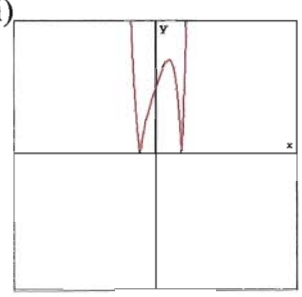
1d. Perform the operation and write the answer in the $a + bi$ form.

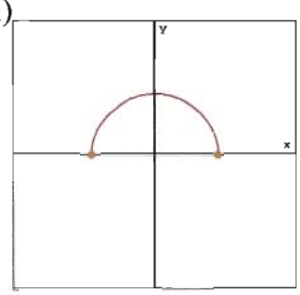
$(2 - i)^2 =$ _____

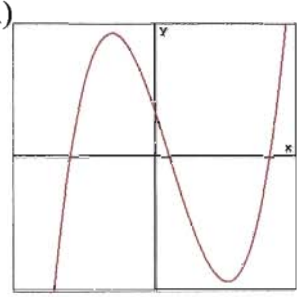
2. Solve the following equation by using the Quadratic Formula. Find all solutions, both real and imaginary (i.e. complex): $x^2 - 5x + 10 = 0$

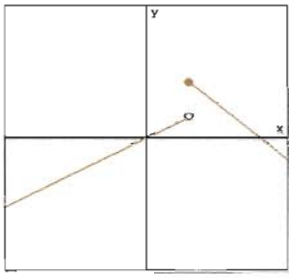
3. Solve the following equation by using the Quadratic Formula. Find all solutions, both real and imaginary (i.e. complex): $3x^2 + 8 = 4$

4. Which of the following graphs could be a polynomial function? Circle the correct answer.

i) 

ii) 

iii) 

iv) 

5. Circle the functions shown here that are polynomials.

5a. $f(x) = 3 + \sqrt{x^4 - 2x - 1}$

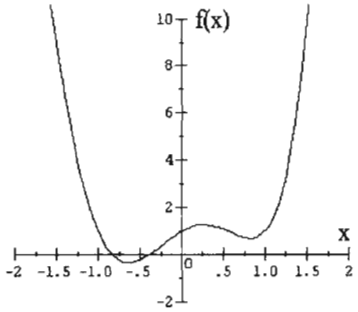
5b. $g(z) = 3 - z^2 - 2z^4$

5c. $h(a) = \frac{2}{5}a^3 - a^2 + a\sqrt{3}$

5d. $p(x) = \frac{2}{5x} - 3x + 1$

5e. $q(x) = (2x^2 - 4)(x^3 + 2x)$

6. Study the graph of the polynomial function f shown here.



6a. How many x-intercepts are shown? _____

6b. How many turning points are shown? _____

6c. What is the smallest degree this function could have? _____

6d. Estimate the coordinates of the middle turning point of f. ☐

6e. What is the domain of f ? domain = ☐

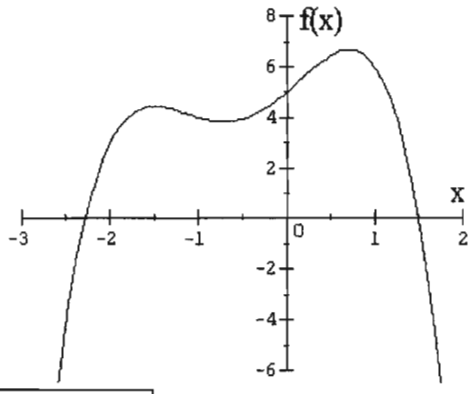
6f. The function f is decreasing on which interval? Circle your answer.

i. $[1.2, 0.7]$ **ii.** $(-\infty, -0.5]$ **iii.** $[-0.7, 0.25] \cup [0.8, \infty)$ **iv.** $(-\infty, -0.7] \cup [0.25, 0.8]$

7. Consider the graph of the polynomial function

$$f(x) = -x^4 - 2x^3 + x^2 + 3x + 5$$

shown here.

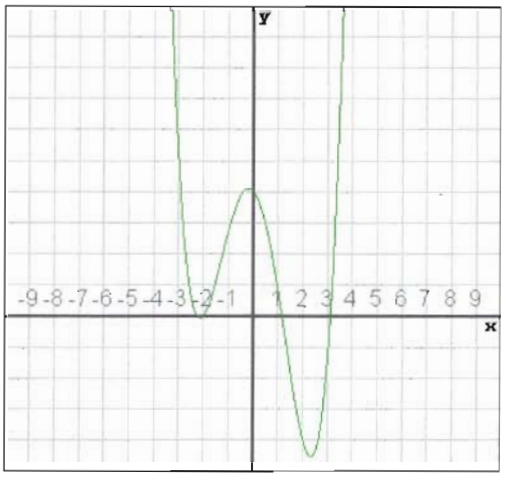


7a. Find the degree of the function f. ☐

7b. Find the leading coefficient of the function f. ☐

7c. Estimate the interval on which the function f is increasing. Write your answer using interval notation.

8. Study the graph of the polynomial function f given here.



8a. *True* or *False*: The leading coefficient is positive. Circle your answer.

8b. What is the minimum of the function f ?

8c. What is the maximum of the function f ?

8d. What are the valley turning points of the function f ?

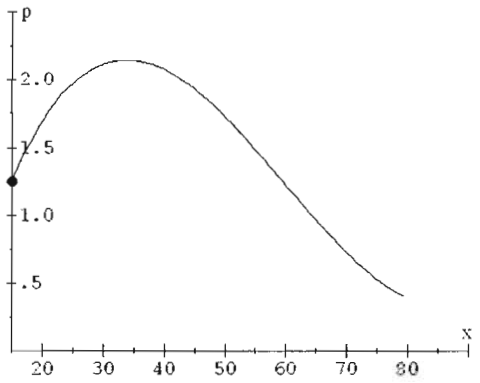
8e. What are the peak turning points of the function f ?

8f. What is the range of f? Write the answer in interval notation.

9. Read the paragraph through once and then fill in the blanks. Consider the polynomial function $h(x) = 0.1x^5 - 2x^2 - 3x + 4$. The degree of the polynomial function is _____ and the lead coefficient of the polynomial function is _____ (positive/negative). The end behavior of the graph of h is that it _____ (falls/rises) on the far left and it _____ (falls/rises) on the far right The maximum number of x-intercepts of this function is _____. The maximum number of turning points of this function is _____.

10. Read the paragraph through once and then fill in the blanks. Consider the polynomial function $f(x) = x^3 - x^6 + 1$. The degree of the polynomial function is _____ and the lead coefficient of the polynomial function is _____ (positive/negative). The end behavior of the graph of f is that it _____ (falls/rises) on the far left and it _____ (falls/rises) on the far right. The maximum number of x-intercepts of this function is _____. The maximum number of turning points of this function is _____.

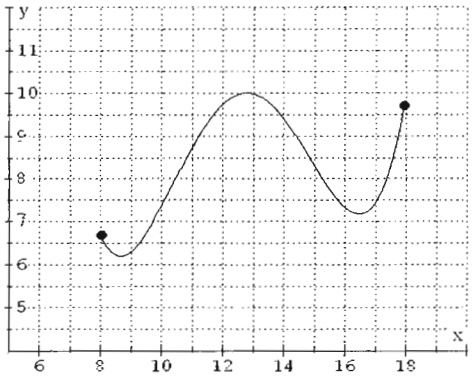
11. The following function approximately depicts the percentage of the population p of the U.S. in 2008 who were age x, for ages 15 and above.



Share of Population as a Function of Age

Estimate the age interval with a rising share of the population.

12. The U6 unemployment rate y is a broad measure of the percentage of adults in the U.S. who cannot find a job. The following function approximately depicts the U6 unemployment rate x years from 1990.



Unemployment as a Function of Elapsed Years

12a. Estimate the coordinates of the turning points of this function.

12b. Interpret your answer(s) from part a in a practical context.

13. *True* or *False*: The function g shown here is exponential. Circle your answer.

x	0	1	2	3
$g(x)$	2	2.4	2.88	3.40

14. Which of the following statements are true for $f(x) = 2^x$? Circle all that are correct.

i. f is a polynomial function of degree 4.
ii. f has two turning points.
iii. f is an exponential function.
iv. $(1, 0)$ is on the graph of f.
v. The domain is all real numbers.
vi. No x-intercepts.

15. Let $f(x) = 16(4)^x$.

15a. Evaluate $f(2) =$ _____

15b. Evaluate $f(0) =$ _____

15c. Evaluate $f(-2) =$ _____

15d. Evaluate $f(\frac{1}{2}) =$ _____

15e. What is the base of this function? Circle your answer.

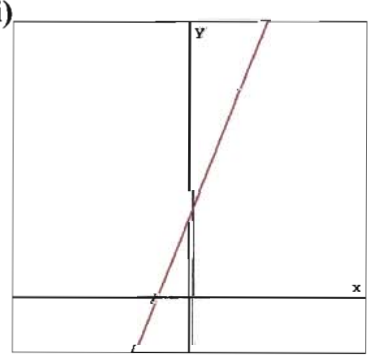
i. 0 **ii.** 4 **iii.** 16 **iv.** 64 **v.** 1

15f. What is the initial value of this function? Circle your answer.

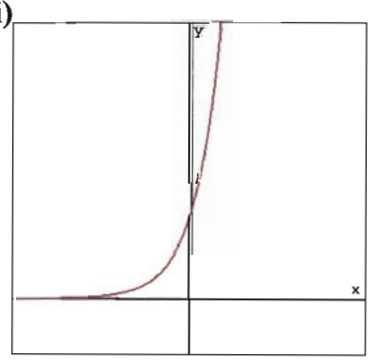
i. 0 **ii.** 4 **iii.** 16 **iv.** 64 **v.** 1

15g. Which of the following graphs *could* be the graph of the function f? Circle your answer.

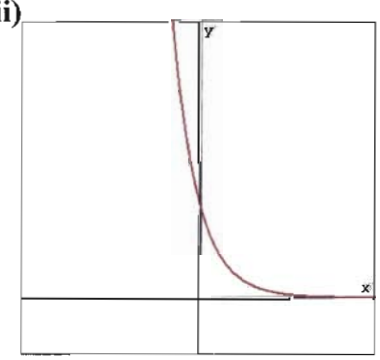
i)



ii)



iii)



16. Daily world oil demand is currently projected to rise at a rate of 1.6% each year from 2005 to 2030. Let $P(t)$ be the daily demand for oil, t years after 2005. Why is it appropriate to assume that P is an exponential function? Briefly explain.

17. The following function can be used to determine the remaining amount y (in mg) of a sample of the radioactive substance kryptonite, t years after the sample was gathered.

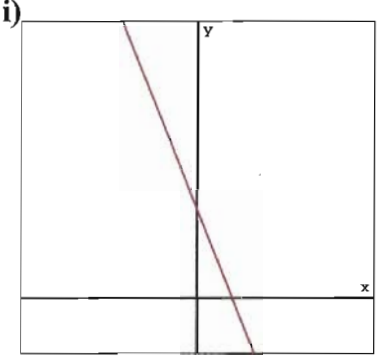
$$y = k(t) = 10(0.8)^t$$

17a. Find the y-intercept of this function and interpret the meaning.

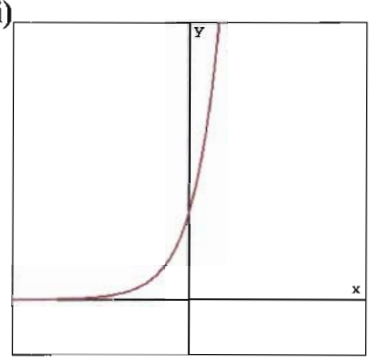
17b. Evaluate $k(2)$ interpret the meaning.

17c. Which of the following graphs *could* be the graph of the function k? Circle your answer.

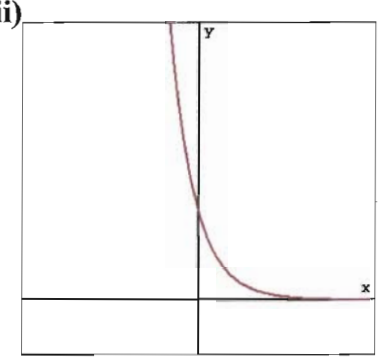
i)



ii)



iii)



18. Evaluate the following logarithmic functions.

18a. $\log_4 16 =$

18b. $\log_3 81 =$

18c. $\log_{25} 5 =$

18d. $\log_8 \frac{1}{8} =$

18e. $\ln 1 =$

18f. $\log 1000 =$

18g. $\ln 10 =$

18h. $\log 2 =$

19. $\frac{1}{100}$

20. Write the following equations in exponential form: **20a.** $\log_2 5 = x$ **20b.** $\ln x = 1.7$

21. Solve: $e^x = 25$

22. Solve: $10^{2x-3} = 15$