

ROCHESTER CITY SCHOOL DISTRICT

Pre-Calculus

Christmas Assessment

STEM High School

2013 – 2014

(student)

Mr. Samuel Simpson

(teacher)

Due - January 6, 2014

1. Simplify $6^{\log_6 9}$.

a) 0

b) 1

c) 6

d) 9

2. Evaluate $\lim_{t \rightarrow 4} \frac{t^2 + 2t - 15}{t - 3}$

a) 5

b) 9

c) -5

d) does not exist

3. Given a function f , which of the following represents a reflection across the x-axis, followed by a horizontal shrink by a factor of $\frac{1}{2}$?

a) $y = -2f(x)$

b) $y = -f(x)/2$

c) $y = -f(x/2)$

d) $y = -f(2x)$

4. Evaluate: $\lim_{n \rightarrow \infty} \frac{10n^2 - 7n}{2n^2 + 5n}$

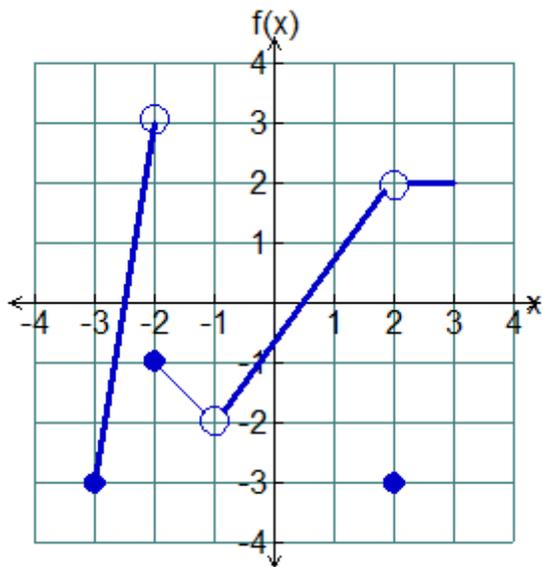
a) 0

b) 5

c) $-\frac{7}{5}$

d) ∞

5. The graph of $f(x)$ is shown below. What is the value of $f(2)$?



a) 2

b) -3

c) 3

d) undefined

6. What are the solutions of the equation $x^3 - 7x - 6 = 0$?

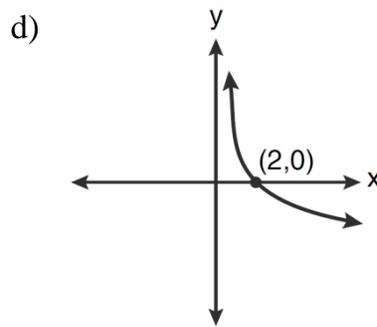
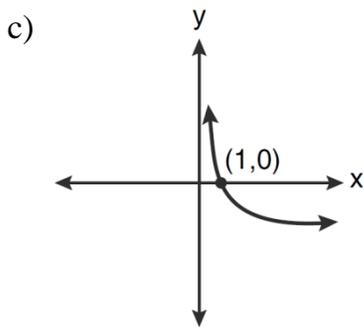
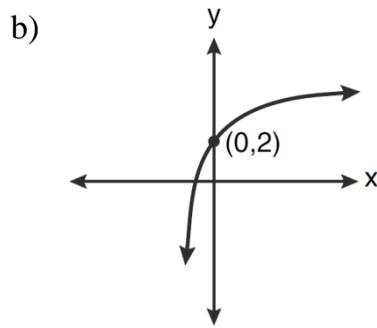
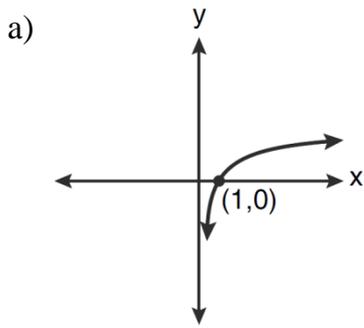
a) -1, -2, 3

b) 1, -2, 3

c) 1, 2, -3

d) -1, 2, -3

7. Which graph represents the function $\log_2 x = y$?



8. In the equation $x^2 - 7x + 2 = 0$, the sum of the roots exceeds the product of the roots by

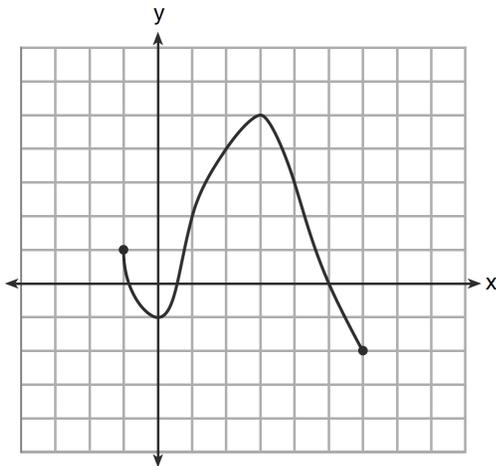
a) 9

b) 5

c) -9

d) -5

9. What is the range of the function shown below?



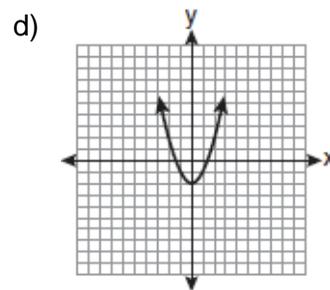
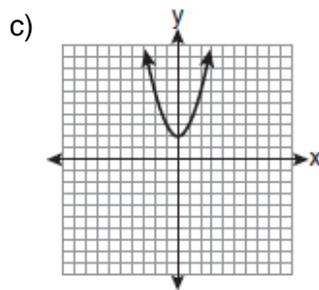
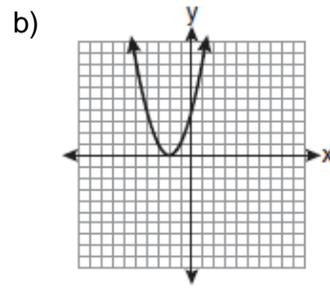
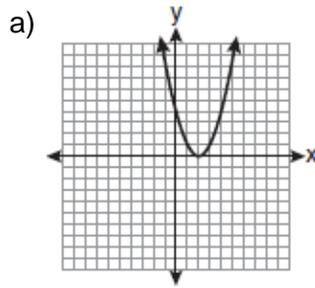
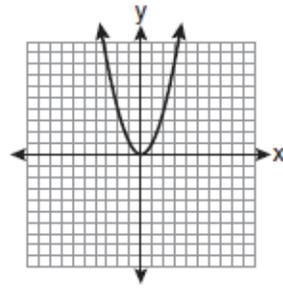
a) $-2 < y < 5$

b) $-2 \geq y \geq 5$

c) $-2 \leq x \leq 5$

d) $-2 \leq y \leq 5$

10. The graph below shows the function $f(x)$. Which graph represents the function $f(x) + 2$



11. Find the value of k such that $x - 2$ is a factor of $2x^3 + 5x^2 - kx + 10$.

a) 0

b) 2

c) 5

d) 23

12. Which quadratic has a root of $5 - i$?

a) $y = x^2 + 25$

c) $y = x^2 + 5x + 24$

b) $y = x^2 + 26$

d) $y = x^2 - 10x + 26$

13. A single cell amoeba doubles every 4 days. About how long will it take one amoeba to produce a population of 1000?

a) 10 days

b) 40 days

c) 250 days

d) 500 days

14. What is the value of x in the equation $4^{6x-9} = 64$

a) $\frac{1}{2}$

b) 2

c) 12

d) 4

15. Akeem invests \$25,000 in an account that pays 4.75% annual interest compounded continuously. Using the formula $A = Pe^{rt}$, where A = the amount in the account after t years, P = principal invested, and r = the annual interest rate, how many years, to the nearest tenth, will it take for Akeem's investment to triple?

a) 10.0

b) 14.6

c) 23.1

d) 24.0

16. Which values of x are in the solution set of the following system of equations?

$$y = 3x - 6$$

$$y = x^2 - x - 6$$

a) 0, -4

b) -6, 2

c) 6, -2

d) 0, 4

17. The expression i^{25} is equivalent to

a) 1

b) -1

c) i

d) $-i$

18. Determine a formula for the exponential function whose values are given below:

x	$g(x)$
-2	-7.14286
-1	-5.0
0	-3.5
1	-2.45
2	-1.715

a) $-1.429 \cdot 0.7^x$

b) $-2.45 \cdot 0.8^x$

c) $-3.5 \cdot 0.7^x$

d) $-3.5 \cdot 0.7^x$

PART II

Answer both questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps and procedures. A correct answer with no work will receive only 1 credit.

1. Find the exact solution algebraically.

$$54\left(\frac{1}{3}\right)^{\frac{2x}{3}} = 2$$

answer: _____

2. Which function is the inverse of the function

$$f(x) = \sqrt[3]{x - 8}$$

answer: _____

3. Completely factor $f(x) = 5x^3 - 12x^2 - 23x + 42$

answer: _____

PART III

Answer both questions in this part. Each correct answer will receive 3 credits. Clearly indicate the necessary steps and procedures. A correct answer with no work will receive only 1 credit.

4. Population of Deer: The population of deer after t years in Cedar State Park in 2010 is modeled by the function:

$$P(t) = \frac{1200}{1 + 99e^{-0.4t}}$$

a) What was the initial population of deer? *answer:* _____

b) When will the number of deer be 600? *answer:* _____

c) What is the maximum number of deer possible in the park? *answer:* _____

5. The midyear median sales prices of new, privately owned one- family houses sold in the United States are given for selected years in Table 2.23. Let x be the number of years since July 1, 2000.

Table 2.23 Median Sales Price of a New House

Year	Price (dollars)
2003	195,000
2004	221,000
2005	240,900
2006	246,500
2007	247,900
2008	232,100

a) Find the quadratic regression model for the data. _____

b) Use the model to predict when the median cost of a new home returned to \$ 200,000.

Pre-Calculus Reference Sheet

Standard Form of a Quadratic Equation	Compounding Interest Formulas	Combination and Permutation Formulas
$ax^2 + bx + c = 0$	<p>Periodic: $A = P \left(1 + \frac{r}{n}\right)^{nt}$</p> <p>Continuous: $A = Pe^{rt}$</p> <p>(where A is the amount due on a principal P invested for t years at an annual interest rate r compounded n times per year)</p>	<p>Combination:</p> ${}_nC_r = C(n, r) = \frac{n!}{(n-r)! r!}$ <p>Permutation:</p> ${}_nP_r = P(n, r) = \frac{n!}{(n-r)!}$
Quadratic Formula		
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ <p>(where $ax^2 + bx + c = 0$, $a \neq 0$)</p>		

Sequences and Series	
<p>Arithmetic sequence: $a_n = a_1 + (n - 1)d$</p> <p>Arithmetic series: $S_n = \frac{n}{2} (a_1 + a_n)$</p> <p>Geometric sequence: $a_n = a_1 r^{n-1}$ or $a_n = a_{n-1} r$</p> <p>Geometric series: $S_n = \frac{a_1 - a_1 r^n}{1 - r}$, where $r \neq 1$</p> <p>Infinite Geometric series: $\sum_{k=1}^{\infty} ar^{k-1} = \frac{a}{1 - r}$, if $-1 < r < 1$</p>	<p>(where a_1 is the first term, n is the number of the term, d is the common difference, r is the common ratio, a_n is the nth term and S_n is the sum of the first n terms)</p>

General Formula for Growth and Decay	
$A = A_0 e^{kt}$ (where A is the amount at the time t , A_0 is the amount at $t = 0$, and k is a constant)	$e \approx 2.718$

Descriptive Statistics
<p>For a set of paired data $\{(x_1, y_1), (x_2, y_2) \dots, (x_n, y_n)\}$:</p> <p>correlation coefficient = $\frac{n(x_1 y_1 + \dots + x_n y_n) - (x_1 + \dots + x_n)(y_1 + \dots + y_n)}{\sqrt{\{[n(x_1^2 + \dots + x_n^2) - (x_1 + \dots + x_n)^2][n(y_1^2 + \dots + y_n^2) - (y_1 + \dots + y_n)^2]\}}$</p> <p>The equation of the least squares regression line for the data is $y = \bar{y} + b(x - \bar{x})$, where \bar{x} and \bar{y} are the means of the x and y values and</p> $b = \frac{n(x_1 y_1 + \dots + x_n y_n) - (x_1 + \dots + x_n)(y_1 + \dots + y_n)}{n(x_1^2 + \dots + x_n^2) - (x_1 + \dots + x_n)^2}$

**ROCHESTER CITY SCHOOL
DISTRICT**

**PRECALCULUS
CHRISTMAS ASSESSMENT
DECEMBER 2013**

ANSWER SHEET

Part I Score: _____

Part II Score: _____

Total Score: _____

Rater's Initials: _____

PUPIL: _____ TEACHER: _____

SCHOOL: _____ GRADE: _____

Your answers to Part I should be recorded on this answer sheet.

PART I

1. _____ 8. _____ 15. _____

2. _____ 9. _____ 16. _____

3. _____ 10. _____ 17. _____

4. _____ 11. _____ 18. _____

5. _____ 12. _____

6. _____ 13. _____

7. _____ 14. _____