ROCHESTER CITY SCHOOL DISTRICT

Pre-Calculus

Thanksgiving Assessment

STEM High School

2013 – 2014

_____
(student)

Mr. Samuel Simpson
(teacher)

Students must have access to a graphing calculator.

Part I

Directions: Answer each question in Part I, a correct answer will receive two (2) credits. No Partial credit will be allowed. Answer must be recorded on the separate answer sheet provided.

1. Determine the domain of $g(x) = \frac{2x}{\sqrt{3x-2}}$.

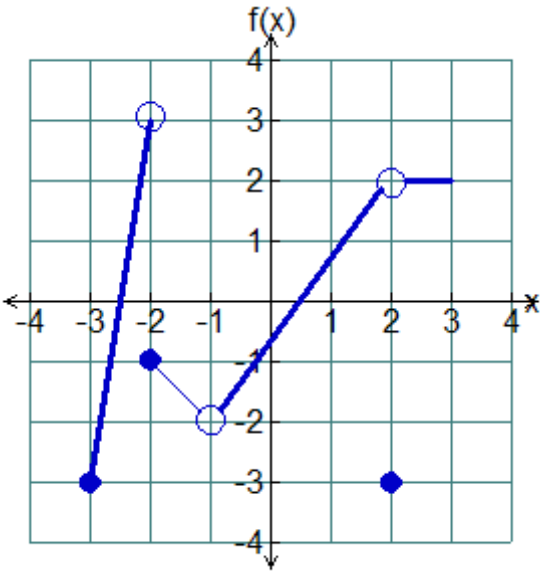
a) $x > \frac{2}{3}$

b) $x \geq \frac{2}{3}$

c) $x \leq \frac{2}{3}$

d) $x > 0$

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



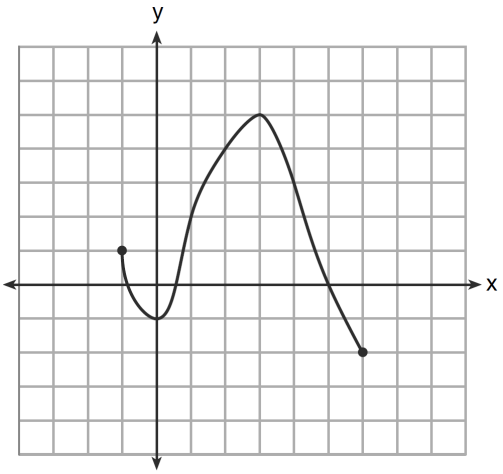
a) –2

b) –1

c) 3

d) undefined

3. What is the domain of the function shown below?



a) $-1 \leq x \leq 6$

b) $-1 \leq y \leq 6$

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

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

4. Which equation is the inverse of $y = 3x$?

a) $y = \frac{1}{3}x$

b) $x = 3$

c) $y = 3$

d) $x = \frac{y}{3}$

5. If $f(x) = \frac{1}{2}x - 3$ and $g(x) = 2x + 5$, what is the value of $(g \circ f)(4)$?

a) -13

b) 3.5

c) 3

d) 6

6. What is the value of x in the equation $2^{3x-1} = 32$

a) 1

b) 2

c) 11

d) 16

7. The product of $(3 + \sqrt{5})$ and $(3 - \sqrt{5})$ is

(1) $4 - 6\sqrt{5}$

(2) $14 - 6\sqrt{5}$

(3) 14

(4) 4

8. The expression $2i^2 + 3i^3$ is equivalent to

(1) $-2 - 3i$

(2) $2 - 3i$

(3) $-2 + 3i$

(4) $2 + 3i$

9. What is the value of x in the equation $9^{3x+1} = 27^{x+2}$?

(1) 1

(2) $\frac{1}{3}$

(3) $\frac{1}{2}$

(4) $\frac{4}{3}$

10. When simplified, the expression $\left(\frac{w^{-5}}{w^{-9}}\right)^{\frac{1}{2}}$ is equivalent to

(1) w^{-7}
(2) w^{2}
(3) w^{7}
(4) w^{14}

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

$$y = 3x - 6$$
$$y = x^2 - x - 6$$

(1) $0, -4$
(2) $0, 4$
(3) $6, -2$
(4) $-6, 2$

12. The roots of the equation $9x^2 + 3x - 4 = 0$ are

(1) imaginary
(2) real, rational, and equal
(3) real, rational, and unequal
(4) real, irrational, and unequal

13. When $x^{-1} - 1$ is divided by $x - 1$, the quotient is

(1) -1
(2) $-\frac{1}{x}$
(3) $\frac{1}{x^2}$
(4) $\frac{1}{(x-1)^2}$

14. The fraction $\frac{3}{\sqrt{3a^2b}}$ is equivalent to

(1) $\frac{1}{a\sqrt{b}}$

(2) $\frac{\sqrt{b}}{ab}$

(3) $\frac{\sqrt{3b}}{ab}$

(4) $\frac{\sqrt{3}}{a}$

15. The minimum point on the graph of the equation $y = f(x)$ is $(-1,-3)$. What is the minimum point on the graph of the equation $y = f(x) + 5$?

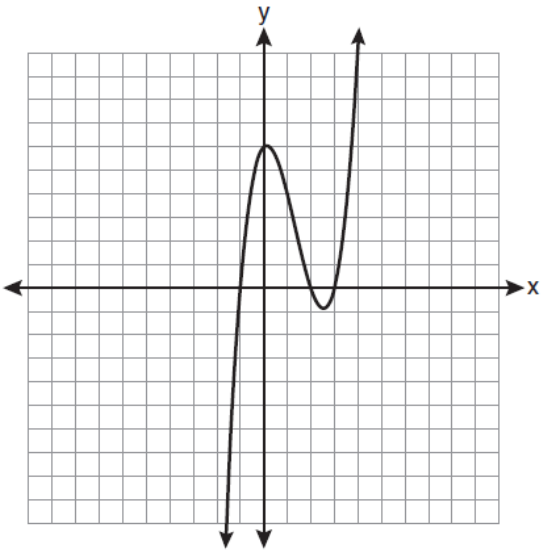
(1) $(-1,2)$

(2) $(-1,-8)$

(3) $(4,-3)$

(4) $(-6,-3)$

16. The graph of $y = x^3 - 4x^2 + x + 6$ is shown below.



What is the product of the roots of the equation $x^3 - 4x^2 + x + 6 = 0$?

(1) -36

(2) -6

(3) 6

(4) 4

17. What is the conjugate of $-2 + 3i$?

(1) $-3 + 2i$
(2) $-2 - 3i$
(3) $2 - 3i$
(4) $3 + 2i$

18. The expression $(x^2 - 1)^{-\frac{2}{3}}$ is equivalent to

(1) $\sqrt[3]{(x^2 - 1)^2}$
(2) $\frac{1}{\sqrt[3]{(x^2 - 1)^2}}$
(3) $\sqrt{(x^2 - 1)^3}$
(4) $\frac{1}{\sqrt{(x^2 - 1)^3}}$

19. The equation $x^2 + y^2 - 2x + 6y + 3 = 0$ is equivalent to

(1) $(x - 1)^2 + (y + 3)^2 = -3$
(2) $(x - 1)^2 + (y + 3)^2 = 7$
(3) $(x + 1)^2 + (y + 3)^2 = 7$
(4) $(x + 1)^2 + (y + 3)^2 = 10$

20. The solution set of the equation $\sqrt{x + 3} = 3 - x$ is

(1) $\{1\}$
(2) $\{0\}$
(3) $\{1, 6\}$
(4) $\{2, 3\}$

Pre-Calculus Reference Sheet

Standard Form of a Quadratic Equation

$ax^2 + bx + c = 0$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(where $ax^2 + bx + c = 0$, $a \neq 0$)

Compounding Interest Formulas

Periodic: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

Continuous: $A = Pe^{rt}$

(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)

Combination and Permutation Formulas

Combination:

$${}_nC_r = C(n, r) = \frac{n!}{(n-r)!\, r!}$$

Permutation:

$${}_nP_r = P(n, r) = \frac{n!}{(n-r)!}$$

Sequences and Series

Arithmetic sequence: $a_n = a_1 + (n-1)d$

Arithmetic series: $S_n = \frac{n}{2}(a_1 + a_n)$

Geometric sequence: $a_n = a_1 r^{n-1}$ or $a_n = a_{n-1} r$

Geometric series: $S_n = \frac{a_1 - a_1 r^n}{1 - r}$, where $r \neq 1$

Infinite Geometric series: $\sum_{k=1}^{\infty} ar^{k-1} = \frac{a}{1-r}$, if $-1 < r < 1$

(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)

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

For a set of paired data $\{(x_1, y_1), (x_2, y_2) \ldots, (x_n, y_n)\}$:

$$\text{correlation coefficient} = \frac{n(x_1y_1 + \ldots + x_ny_n) - (x_1 + \ldots + x_n)(y_1 + \ldots + y_n)}{\sqrt{\{[n(x_1^2 + \ldots + x_n^2) - (x_1 + \ldots + x_n)^2][n(y_1^2 + \ldots + y_n^2) - (y_1 + \ldots + y_n)^2]\}}}$$

The equation of the least squares regression line for the data is $y = \overline{y} + b(x - \overline{x})$, where $\overline{x}$ and $\overline{y}$ are the means of the x and y values and

$$b = \frac{n(x_1y_1 + \ldots + x_ny_n) - (x_1 + \ldots + x_n)(y_1 + \ldots + y_n)}{n(x_1^2 + \ldots + x_n^2) - (x_1 + \ldots + x_n)^2}$$

ROCHESTER CITY SCHOOL DISTRICT

PRECALCULUS
PRE ASSESSMENT
OCTOBER 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

ANSWER ONLY 15 QUESTIONS FROM THIS PART.

1.	_____	8.	_____	15.	_____
2.	_____	9.	_____	16.	_____
3.	_____	10.	_____	17.	_____
4.	_____	11.	_____	18.	_____
5.	_____	12.	_____	19.	_____
6.	_____	13.	_____	20.	_____
7.	_____	14.	_____		