

NAME _____

JUNE 2016

CALCULUS
OPTIONAL SUMMER WORK

PART I - No CALCULATOR

I. COORDINATE GEOMETRY

- 1) Identify the indicated quantities for $-8x + 15y = 20$. x-int _____
y-int _____
slope _____
- 2) A line has a slope of $5/7$ and contains the points $(2, 14)$ and $(x, -6)$. Find the value of x .

- 3) Find the equation of a line through the points $(9, -8)$ and $(-12, 6)$.

- 4) Write the equation of the line perpendicular to $2x - 5y = -16$ and through the point $(9, -2)$.

II. FACTORING AND POLYNOMIALS

- 1) Factor each of the following completely.
- a) $6a^2 - 35a + 50$ b) $128n^2y - 98k^2y$

c) $2m^3n^2 - 6m^3n - 108m^3$

d) $125x^3 + 27y^3$

2) Solve each of the following equations algebraically:

a) $x^2 - 9x = 52$

b) $6n^2 - 7n - 20 = 0$

c) $6y^4 + 22y^3 - 24y^2 - 88y = 0$

d) $5w^2 - 6w + 12 = 0$

III. FUNCTIONS

1) Evaluate each of the following given:

$$f(x) = 2x^2 - 9$$

$$g(x) = 10 - 3x$$

$$h(x) = \frac{6x}{3x - 8}$$

a) $f(-7)$

b) $h(-4)$

c) $g(f(-1))$

d) $f(g(h(2)))$

e) $f(3a - 2)$

2) Identify the domain and range of each of the following functions. Determine if the function is one-to-one.

a) $f(x) = 5x - 7$

b) $g(x) = \frac{4x - 1}{x^2 - 4x - 21}$

c) $h(x) = \sqrt{x+1}$

d) $f(x) = |2x - 9|$

e) $g(x) = \sqrt[3]{x-2}$

f) $h(x) = 2x^2 - 8x - 11$

g) $f(x) = 4 \cos 3x + 2$

h) $g(x) = 3e^x - 1$

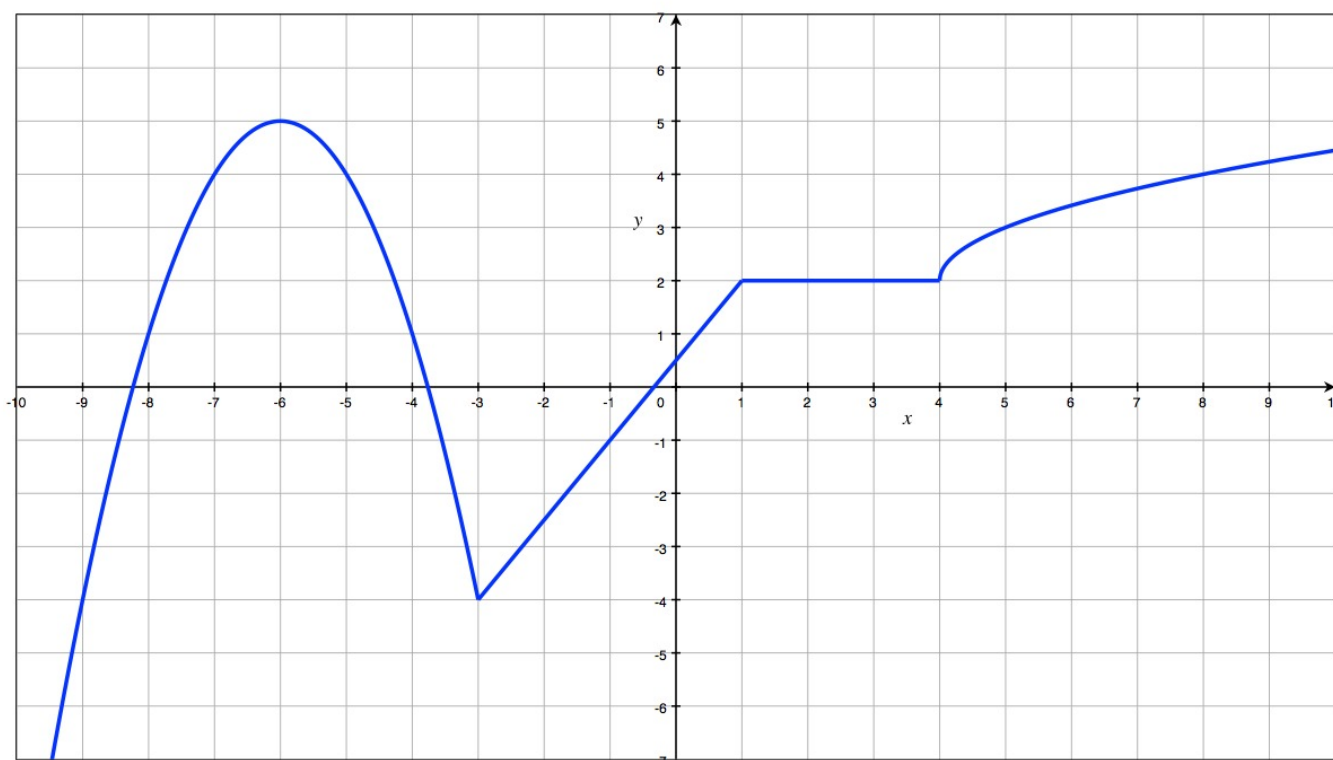
i) $h(x) = 2 \ln(x - 3) + 4$

j) $f(x) = \sqrt{\frac{x-4}{x+1}}$

3) Determine if the following functions are even, odd, or neither.

a) $f(x) = 2x^3 + x$	b) $g(x) = \frac{5x^2}{3x - 7}$	c) $h(x) = \sqrt{43 - x^2}$

4) Complete the following questions based on the graph shown.



a) Determine the intervals where the function is increasing.

b) Determine the intervals where the function is decreasing.

c) Determine the intervals where the function is constant.

d) Determine the intervals where the function is concave up.

e) Determine the intervals where the function is concave down.

f) Determine the relative maxima of the function.

g) Determine the relative minima of the function.

5) For each of the following functions, identify the shape of the graph. Also identify any transformations including shifts and reflections.

a) $g(x) = -(x - 3)^2 + 10$ Shape: _____

Transformations: _____

b) $k(x) = -|x + 1| - 7$ Shape: _____

Transformations: _____

IV. RATIONAL EXPRESSIONS

1) Simplify: $\frac{2x^2 - 14x}{4x^2 - 19x - 5} \cdot \frac{16x^2 - 1}{12x - 6x^2} \div \frac{8x - 56}{3}$

2) Simplify: $\frac{3x-10}{x^2-25} - \frac{4}{x+5}$

3) Simplify: $\frac{\frac{2}{3x+12} - \frac{10}{x-4}}{\frac{3x}{x^2-16} - \frac{5}{x+4}}$

V. RADICALS

1) Simplify each of the following expressions.

a) $3\sqrt{48} - 2\sqrt{75} + 7\sqrt{20}$

b) $\frac{10 + 3\sqrt{6}}{2 - 4\sqrt{3}}$

2) Solve the each of the following equations.

a) $2\sqrt{3x+5} + 1 = 17$

b) $\sqrt{4x-11} + 4 = x$

VI. EXPONENTS

1) Simplify each of the following expressions.

$$a) \left(\frac{7a^{-6}c}{a^{-5}b^2c^{-4}} \right)^{-3}$$

$$b) (-2x^{\frac{2}{3}}y^{\frac{-5}{6}})(-3x^{\frac{1}{4}}y^{\frac{1}{2}})$$

$$c) \frac{-20a^{\frac{2}{3}}b^{\frac{1}{6}}}{38a^{\frac{1}{5}}b^{\frac{3}{4}}}$$

$$2) \text{ Solve: } \frac{x^{16}y^2}{4x^{11}y^{-3}} \cdot \frac{5x^2y^{-4}}{3x^6y} = \frac{1}{24}$$

VII. EXPONENTIAL EXPRESSIONS

Simplify each of the following expressions.

$$1) 2e^3 \cdot 5e^4 \underline{\hspace{2cm}}$$

$$2) \frac{12e^7}{4e^3} \underline{\hspace{2cm}}$$

$$3) (3e^{-4x})^2 \underline{\hspace{2cm}}$$

$$4) \sqrt{25e^{6x}} \underline{\hspace{2cm}}$$

$$5) (2e^{3x-1})^5 \underline{\hspace{2cm}}$$

$$6) (-2e^{7x})(3e^4) \underline{\hspace{2cm}}$$

VIII. LOGARITHMIC FUNCTIONS

1) Evaluate each of the following.

a) $\log_2 8$ _____ b) $\log_{17} 17^4$ _____ c) $\log_9 -9$ _____

d) $\log_{15} 1$ _____ e) $\log_{16} \frac{1}{64}$ _____ f) $\log_3 \frac{1}{9}$ _____

g) $\ln e^5$ _____ h) $\log_{36} 6$ _____ i) $\log 0.0001$ _____

2) Expand the expression: $\ln 3xy^2$. _____

3) Expand the expression: $\log \frac{x^5 \sqrt{y}}{z^4}$. _____

4) Condense the expression: $5 \log 2 + \frac{1}{3} \log (x + 7)$ _____

5) Condense the expression: $2 \ln 5 - 4 \ln w - 3 \ln y$ _____

IX. TRIGONOMETRIC FUNCTIONS

Evaluate each of the following expressions.

1) $\sin \frac{7\pi}{6}$

2) $\tan \frac{-4\pi}{3}$

3) $\cot \frac{-11\pi}{3}$

4) $\cos \frac{11\pi}{6}$

5) $\cos 14\pi$

6) $\tan \frac{7\pi}{4}$

7) $\cot \frac{23\pi}{2}$

8) $\sec \frac{2\pi}{3}$

9) $\csc 181\pi$

10) $\sin^{-1} \frac{1}{2}$

11) $\arccos \frac{-\sqrt{3}}{2}$

12) $\tan^{-1} -1$

13) $\arcsin -1$

14) $\cos^{-1} 0$

15) $\arctan 0$

16) $\arccos -1$

17) $\sec \left(\sin^{-1} \frac{-12}{13} \right)$

18) $\tan \left(\arccos \frac{-3}{5} \right)$

PART II - WITH CALCULATOR**I. COORDINATE GEOMETRY**

- 1) The data in the table represents the number of people, P , that enter a subway station at a given time, t , where $t = 0$ represents 12 A.M. Estimate the rate of change of the number of people entering the subway station at 10 A.M. Explain the meaning of your answer.

t (hours)	0	4	8	12	16	20
P (people)	458	233	786	614	598	436

- 2) The mountain gorilla population in the Virunga rain forest was reported to be 314 in 1996. In 2007, the population was reported to be 380 gorillas.
- Determine the average rate of change of the gorilla population per year.
 - Write a linear equation representing the relationship between P , the gorilla population, and t , the time in years.
 - What should the gorilla population be by the year 2035?
 - In what year will the gorilla population be 476 animals?

3) Solve the following systems:

$$a) \begin{cases} 4x + y = 5 \\ x^2 + 2y^2 - 3x - 4y = 28 \end{cases}$$

$$b) \begin{cases} x - y^2 = -17 \\ x + 3y = 11 \end{cases}$$

II. EXPONENTIAL FUNCTIONS

Solve each of the following equations. Round your final answers to thousandths.

1) $2^{3x} = 8^{2x+4}$

2) $16^{2x+11} = 64^{3x-4}$

3) $e^{\ln(2x-5)} = 17$

4) $e^{2x-3} + 5 = 10$

5) $\frac{4}{2-e^{-x}} = 5$

6) $xe^{2x} - 2xe^x - 3x = 0$

III. LOGARITHMIC FUNCTIONS

Solve each of the following equations. Round your final answers to thousandths.

1) $1 + 2 \log_3(x-1) = 5$

2) $\ln(2x-3) + \ln x = \ln 5$

3) $\ln e^{5x+1} = 10$

4) $\ln 2 - \ln(x-7) = 4$

IV. TRIGONOMETRIC FUNCTIONS

1) In $\triangle ABC$, $m\angle A = 90^\circ$, $a = 12$, and $b = 10$. Solve the triangle. Round angle measurements to tenths.

2) A surveyor is standing 80 feet from the base of a large tree. The surveyor measures the angle of depression from the top of the tree as 43° . How tall is the tree? Round your final answer to thousandths.

3) A zip-line steel cable is being constructed for a reality television competition show. The high end of the zip-line is attached to the top of a 74-foot pole, and the zip line is 200 feet long. Find the angle of elevation of the zip-line. Round your final answer to tenths.