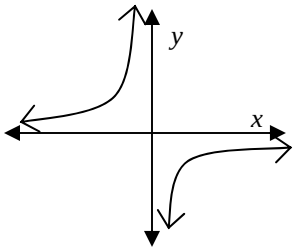
Functions, Statistics, and Trigonometry
First Semester Final Exam Review

Non-Calculator

(2-1) 1) **a.** Determine the domain and range of the relation described by the graph.

b. State whether the relation is a function and justify your answer.



1. a_____

b_____

(2-1) 2) Evaluate each of the following for f(m)= $3m^2 + 2.5$.

a. f(2) **b.** f(-2) **c.** f(2+(-2))

2. a_____
b_____
c_____

(2-4) 3) **a.** Sketch the graph of $f(x) = 5\left(\frac{1}{2}\right)^x$

b. Identify whether this function shows exponential growth or decay.

3. a

b_____

(2-6) 4) Given the quadratic function: $f(x) = -x^2 - 8x + 48$

a. Find the y-intercept. **b.** Find the x-intercept(s).

c. Find the vertex. **d.** Is the vertex a maximum or minimum?

4. a_____

b._____

c._____

d._____

(2-6) 5) Sketch the graph of $f(x) = x^2 - 4$.

5.

(2-7) 6) Let g(x)=$\lfloor 4x - 1.5 \rfloor$. Evaluate g(-1.25).

6. _____

(3-1) 7) Multiple Choice Let $g(x) = 12 - x^2$. Which is an equation for *p*, the parent function of *g*?

A) p(x)=12 B) p(x)= $-x^2$ C) p(x)= x D) p(x)= x^2

7. _____

(3-2) 8) Consider the function g with $g(x) = x^3$.
a. Find an equation for the image of the graph of g under the transformation T: $(x,y) \rightarrow (x-7, y-1)$.
b. Describe in words the effect T has on the graph of g.

8. a_____

b_____

(3-2) 9) Let f be the function $f(x) = |x+1| + 3$
a. Find an equation p, the parent function of f.
b. State a rule for the translation T that maps p to f.
c. Graph the function f.

9. a_____

b_____

c

(3-2) 10) Suppose the point (-6,5) lies on the graph of a function h. Find a point that lies on the image of h under the translation $(x,y) \rightarrow (x+3, y-4)$.

10. _____

(3-5) 11) What transformation maps the graph of $y = 5^x$ onto the graph of $y = \frac{1}{3}(5)^{2x}$?

11. _____

(3-5) 12) Consider the function f with $f(x) = x^2$. Find an equation for the image of the graph of f under the translation: $T : (x, y) \rightarrow (3x, \frac{1}{5}y)$.

12. _____

(3-5) 13) Multiple choice. Which scale change has the effect on a graph of shrinking horizontally by a factor of 3 and shrinking vertically by a factor of 2?

A) $S : (x,y) \rightarrow (\frac{1}{3}x, \frac{1}{2}y)$ B) $S : (x,y) \rightarrow (\frac{1}{3}x, 2y)$

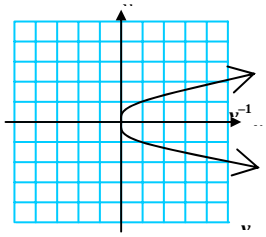
C) $S : (x,y) \rightarrow (3x, \frac{1}{2}y)$ D) $S : (x,y) \rightarrow (3x, 2y)$

13. _____

(3-4) 14) Consider the function f with $f(x) = 6x^5 + 7x^3 - x$. Prove whether f is even, odd, or neither.

14. answer at left

(3-4) 15) Identify the symmetry of the graph. Include all points of symmetry and / or lines of symmetry.



15. _____

(3-7) 16) Let $f(x) = \sqrt{x+5}$ and let $g(x) = 38 - 2x$.
a. Evaluate $(f \circ g)(8)$.
b. Evaluate $(g \circ f)(8)$.
c. Find a formula for $(f \circ g)(x)$.
d. Give the domain of $f \circ g$.

16a _____ b_____

c_____

d_____

(3-7) 17) Let $f(x) = x^2 - \frac{1}{3}$ and let $g(x) = 3x$.

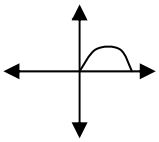
a. Evaluate $g(f(2))$.

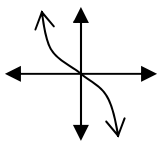
b. Find a formula for $g(f(x))$.

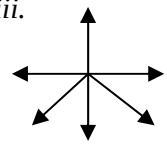
17 a_____

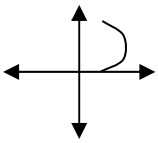
b_____

(3-8) 18) Choose from the graphs below. Identify all the graphs that represent relations whose inverse are functions.

i. 

i. 

iii. 

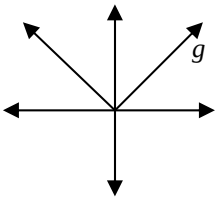
iv. 

18. _____

(3-8) 19)**a.** Name the parent function studied in this chapter whose graph most closely resembles the graph of *g*.

b. Graph the inverse of *g*.

c. Is the inverse of g a function? Justify your answer.



19 a_____

b

c_____

(3-8) 20) Multiple choice. Let *h* be a function with $h(x) = 3x - 2$. Which is an equation of h^{-1}?

A) $h^{-1}(x) = \frac{3}{x-2}$ B) $h^{-1}(x) = \frac{x}{3} + \frac{2}{3}$

C) $h^{-1}(x) = \frac{1}{3}x + 2$ D) $h^{-1}(x) = \frac{1}{3} + x$

20. _____

(3-8) 21) **a.** Find the inverse of the function $y = \frac{1}{x} + 2$.

b. State whether the inverse is a function. Justify your answer.

21. a_____

b_____

(6-2) 22) Evaluate $\left(\frac{64}{27}\right)^{\frac{-1}{3}}$. Give an exact answer.

22. _____

(6-2) 23) Evaluate $81^{\frac{-3}{4}}$.

23. _____

(6-2) 24) Evaluate $\sqrt[4]{625x^{20}}$

24. _____

(6-2) 25) Write $\sqrt[3]{ab^2}$ without a radical sign. Assume $a > 0$ and $b > 0$.

25. _____

(6-2) 26) Write $(mn^3)^{\frac{1}{5}}$ with a radical sign. Assume $m > 0$ and $n > 0$.

26. _____

(6-3) 27) Multiple Choice: Evaluate $\log 10$.

A. $\frac{1}{10}$ B. 1 C. 0 D. –1

27. _____

(6-3) 28) Graph $\log_a x = y$ for $a > 1$

28.

(6-5) 29) Evaluate $\log_3 1.5 + \log_3 54$.

29. _____

(6-5) 30) Evaluate $5\log_4 2 + \log_4 8$. Give an exact answer.

30. _____

(6-5) 31) Evaluate $\log_6 72 - \log_6 2$. Give an exact answer.

31. _____

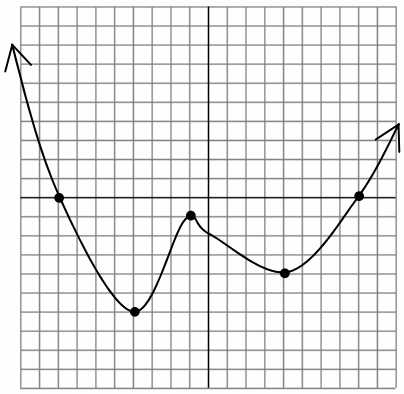
(6-5) 32) Use the fact that $\log_b 10 \approx 1.4307$ and $\log_b 6 \approx 1.1133$ to evaluate $\log_b 60$.

32. _____

(6-5) 33) Use the fact that $\log_b 3 \approx 0.5646$ and $\log_b 8 \approx 1.0686$ to evaluate $\log_b 72$.

33. _____

(9-2) 34). For the given graph below, find each:
a. All extrema
b. All relative extrema
c. The Zeros
d. Intervals where the function is increasing
e. Intervals where the function is decreasing
f. Intervals where the function is positive
g. Intervals where the functions is negative
h. The y-intercept



34. a _____

b _____

c _____

d _____

e _____

f _____

g _____

h _____

(9-4) 35). Find the quotient $q(x)$ and remainder $r(x)$ when $x^4 - 3x^3 - 2x^2 - x + 4$ is divided by $x + 1$.

35. _____

(9-4) 36) Find the quotient $q(x)$ and remainder $r(x)$ when $4x^4 - 4x^3 + x^2 - 2x + 8$ is divided by $2x - 3$.

36. _____

(9-6) 37) Solve the equation $2x^2 + 3x + 8 = 0$ and express the solutions in $a + bi$ form.

37. _____

(9-8) 38) Factor $27p^3 + 125q^3$

38. _____

(9-9) 39) Factor $x^3 - 7x^2 - 4x + 28$

39. _____

(9-9) 40) Factor $10x^2 - 39x + 14$

40. _____

(9-9) 41) If $g(m) = 2m^3 + m^2 - 40m - 75$ and $g(5) = 0$, then rewrite $g(m)$ in factored form.

41. _____

Calculator Allowed: Round decimal answers to the nearest hundredth.

(2-1) 42) Let R= $\{(4,-1),(6,1),(-4,0),(-1,1)\}$.

a. State the domain of R.
b. State the range of R.
c. True or false. R is a relation.
d. True or false. R is a function.

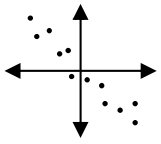
42. a _____

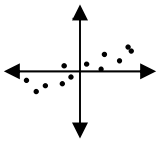
b_____

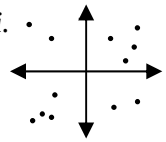
c_____ d._____

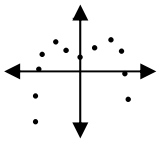
(2-2) 43) For a set of data, the line of best of fit is given by y = - 0.48 + 0.23x, and $r^2 \approx 0.30$

a. What is the correlation coefficient?
b. Multiple Choice Which scatterplot could represent this data?

i. 

ii. 

iii. 

iv. 

43. a_____

b_____

(2-3) 44) The table below shows ages of dogs as related to ages of humans.

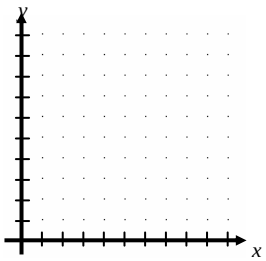
Dog Age (years)	0.5	1	2	3	5	7	9	12	16
Equiv. Human Age (yr.)	7	14	22	28	37	50	61	75	90

a. Draw a scatterplot of the data and a line of fit. Be sure to label the axes.
b. Find an equation for your line of fit using (1, 14) and (7, 50).

c. Use your line of fit to find the human age of an 18-year-old dog.

d. Find the center of gravity.

e. Show that the center of gravity is on the line of best of fit: y=5.29x+10.03.

44. a. 

b. _____

c. _____

d. _____

e. _____

(2-3) 45) Use the table to answer the questions below. The table gives the annual salary (in thousands) of instructional staff in US public elementary and secondary schools for selected years.

Year	1960	1970	1980	1990	1991	1992	1993	1994	1995
Salary	5.2	9.0	16.7	32.6	34.4	35.6	36.5	37.4	38.5

a. Find an equation for the line of best fit for these data. Let the independent variable be the number of years after 1960.
b. Use your model from part a to estimate the salary of instructional staff in 1989. Is your answer to part b interpolation or extrapolation?
c. Use your model to predict the salary for 1994. What is the error in this prediction?

45.a _____

b_____

c_____

(2-4) 46) The population of Cedar Ridge was about 3500 in 1986 and was increasing at a rate of 5.1% annually.
a. Write an equation that gives the population p, n years after 1986.
b. Predict the population in the year 2010.

46.a _____

b_____

(2-5) 47) The radioactive substance polonium-210 decays at a rate of about 27% per day. Suppose a 200-milligram sample of polonium-210 is stored in a bottle and left on a laboratory shelf.
a. Write an equation for the amount of polonium a remaining after d days.
b. How many days will it take for half the polonium to decay?

47. a _____

b_____

(2-5) 48) A ball is thrown straight upward from a height of 1.5 meters with an initial velocity of 18m/s. Use Newton's formula: $h = \frac{-1}{2} gt^2 + v_o t + h_o$.

a. Acceleration due to gravity is 9.8 m/s^2 . Find an equation that gives the ball's height h meters above ground level as a function of time t seconds after it is thrown.
b. How long after the ball is thrown will it hit the ground?

48.a _____

b_____

(2-6) 49) The table below shows data about the winning Winter Olympic times for the women's 3000m speed skater race in recent years. Find a quadratic model for the data. Let x represent the number of years since 1980.

49. _____

Year	1980	1984	1988	1992	1994
Time (sec.)	272.13	264.79	251.94	259.90	257.43

(2-7) 50) Multiple Choice At a local service bureau, you can rent time on a computer. Here is the schedule.

50._____

Time	Cost
0-5 minutes	\$1.50
After 5 minutes	\$0.12 for each minute (or fraction there of)

Which is the formula for the amount A in dollars the service bureau will charge for t minutes on the computer? (Assume that $t \geq 5$.)

A) $A=15-1.2\lceil 1-t \rceil$ B) $A = 12 + .12\lceil t - 1 \rceil$

C) $A = 1.5 + .12\lceil t \rceil$ D) $A = 1.5 + .12\lceil t - 5 \rceil$

(6-4) 51) At the time he was born, Andrew's grandparents invested \$1000 for him in an account that has an annual interest rate of 12%, compounded continuously. Andrew is not allowed to withdraw the money until his 18th birthday. What will be the total amount in the account at that time?

51. _____

(6-4) 52) The amount A of radioactivity from a nuclear explosion is estimated to decrease exponentially by $A = A_0 e^{-2t}$, where t is measured in days. How long will it take for the radioactivity to reach $\frac{1}{1000}$ of its original intensity?

52. _____

(6-5) 53) Rewrite as a single logarithm: $\frac{3}{2}\log_3 b - 4\log_3 c.$

53. _____

(6-5) 54) Rewrite as a single logarithm: $7\ln x + 12\ln w$

54._____

(6-6) 55) Solve $7^x = 4$.

55. _____

(6-6) 56) Solve $10 \cdot 5^x + 25 = 225$

56. _____

(6-6) 57) Solve $\log_5 x - \log_5 3 = 4$

57. _____

(6-6) 58) Solve $\log_7 (2x - 4) = 3$

58. _____

(6-6) 59) Solve $\log_5 (3x + 7) = \log_5 28$

59. _____

(6-6) 60) Multiple Choice: If $21(12)^n = 5556,$ n equals:
A. 2.47 B. 0.165 C. 2.245 D. 22.048

60. _____

(6-6) 61) A machine used in industry depreciates continuously, so that after 5 years it is worth half of its original value. After how many years, to the nearest month, would the machine be worth 20% of its original value?

61. _____

(9-3) 62) In the following table, g is a polynomial function. Determine an equation for $g(x)$.

X	0	1	2	3	4	5	6	7
G(x)	-3	-5	-3	9	37	87	165	277

62. _____

(9-6) 63) Let $x = -1 + i$ and $y = 1 + 2i.$ Express each of the following in $a + bi$ form.

a. $x + y$ **b.** xy **c.** $\frac{x + y}{xy}$

63.a_____

b_____

c_____

(9-5) 64) Find an equation for a polynomial function of unknown degree and zeros $-8, -\frac{3}{4}, \frac{1}{5}, \text{and } 2$.

64. _____

(9-5) 65) Find an equation for a polynomial of degree 6 with the following zeros: $x = 6$ of multiplicity 2, $x = -1$ of multiplicity 1, and $x = -\frac{3}{5}$ of multiplicity 3.

65._____

(9-5) 66) Multiple Choice: If q is a polynomial function and $q(-4) = 0$, which of the following is a factor of $q(x)$?

A. –4x B. x-4 C. 4x-1 D. x+4

66. _____

(9-6) 67) Express $\frac{2-5i}{1+7i}$ in $a+bi$ form.

67. _____

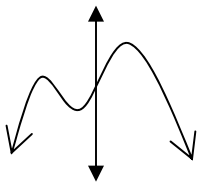
(9-7) 68) Find all zeros of $y = x^3 - x^2 - 7x + 15$. Show work to justify your answers.

68. _____

(9-7) 69) Find all zeros of $y = 9x^4 - 6x^3 + 19x^2 - 12x + 2$. Show work to justify your answers.

69. _____

(9-7) 70) Part of the graph of a polynomial function g is shown below.
a. What is the smallest number of real zeros that g can have?
b. What is the lowest degree g can have?



70.a_____

b_____