Name:_____ Date:_____

Summer Assignment Algebra 2H

Due: Wednesday, September 5, 2018 - Answer each of the following questions algebraically. Show all work/thinking for each question (including multiple choice). Guess and check will not be accepted. This assignment *may* be graded. You will have a quiz on this information during the first week of school.

Linear Functions

1. Write the equation of a line perpendicular to the line $2x + 3y = 9$ and passing through the point (3, -6).

2. Write the equation of a line parallel to a line containing the points (−3, 1) and (6, 4) and passing through the point (5, 2).

3. Find the x and y intercepts of the equation $2y + 17 = 6x - 19$.

Quadratics & Polynomials

4. Which of the following equations in vertex form represents completing of the square of $y = 3x^2 + 6x - 9$?

(1) $y = 3(x + 1)^2 + 4$
(2) $y = (3x + 3)^2 - 12$
(3) $y = 3(x + 1)^2 - 12$
(4) $y = 3(x + 1)^2 - 4$

5. Which of the following represents the range of the function $g(x) = 5(x-2)^2 - 7$?

(1) $y \geq -10$
(2) $y \leq 35$
(3) $y \geq -7$
(4) $y \leq 5$

6. Which of the following is the turning point of the parabola whose equation is $y = (x+1)(x-7)$?

(1) $(3, -16)$
(2) $(1, -12)$
(3) $(-3, 20)$
(4) $(8, 9)$

7. Which statement is true about the quadratic funtions $g(x)$, shown in the table below, and $f(x) = (x - 3)^2 + 2$?

(1) They have the same vertex
(2) They have the same zeros
(3) They have the same axis of symmetry
(4) They intersect at two points

x	g(x)
0	4
1	–1
2	–4
3	–5
4	–4
5	–1
6	4

8. Find the solutions of the equation $y^2 - 3y = 9$ in simplest radical form.

9. What are the y-intercepts of the circle whose equation is $(x + 2)^2 + (y - 4)^2 = 13$?

(1) -2 and 4
(2) 1 and 7
(3) $4 \pm \sqrt{17}$
(4) There are no y-intercepts.

10. What is the solution set of the equation $3x^2 - 34x - 24 = 0$?

(1) $\{-2, 6\}$
(2) $\{-12, \frac{2}{3}\}$
(3) $\{-\frac{2}{3}, 12\}$
(4) $\{-6, 2\}$

11. Find the zeros for $f(x) = x^4 - 4x^3 - 9x^2 + 36x$ algebraically.

12. Which of the following expressions is one of the factors found when factoring $16x^4 - 100x^2 + 144$ completely?

(1) $(x + 2)$
(2) $(x - 4)$
(3) $(x + 9)$
(4) $(4x + 3)$

13. Which of the following expressions correctly expresses the height of a triangle with a base of $6x^2 - 10$ and an area of $3x^4 - 53x^2 + 80$?

(1) $(x + 4)(x + 4)$
(2) $(x + 4)(x - 4)$
(3) $(x - 4)(x - 4)$
(4) $x^2 + 16$

14. Find the solutions of $x^4 - 13x^2 + 12 = 0$ algebraically in simplest form.

15. Given the equation $x^2 - 8x + 15 = 0$. Which statement is true? Justify your answer.

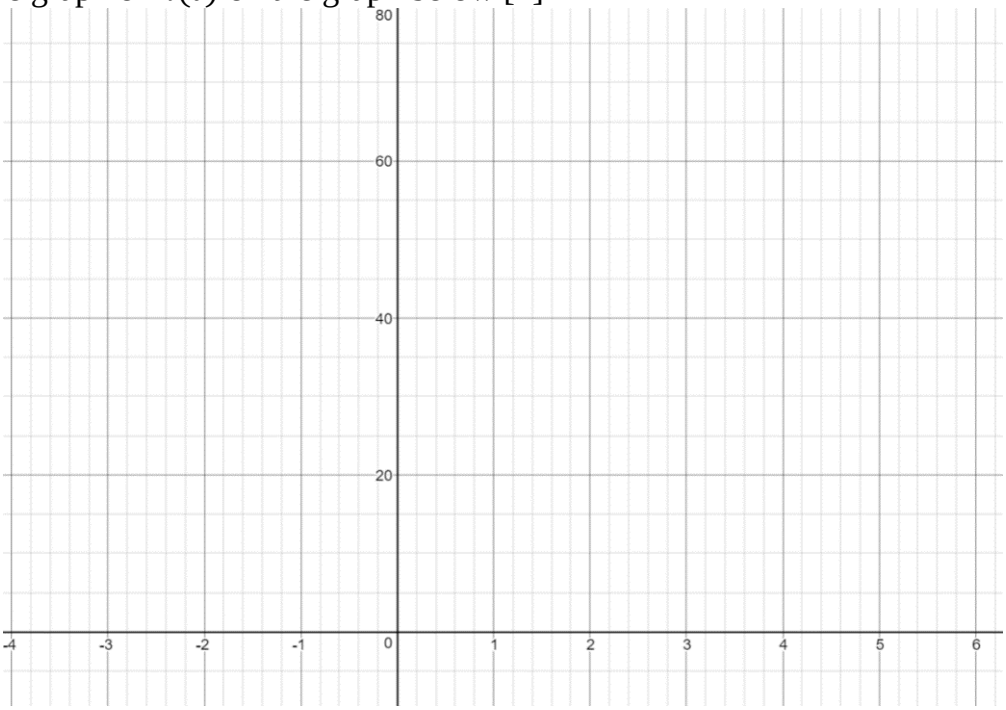
(1) The sum of the roots is 15.
(2) Both roots are greater than zero.
(3) One root is less than zero and the other root is greater than zero.
(4) One root is zero and the other root is greater than zero.

16. A ball is shot out of a homemade air cannon. It flies through the air such that its height as a function of time is given by:

$$h(t) = -16t^2 + 64t + 10$$

where *h* is the height of the ball in feet and *t* is the time since it was fired in seconds.

(a) Sketch the graph of $h(t)$ on the graph below [1]

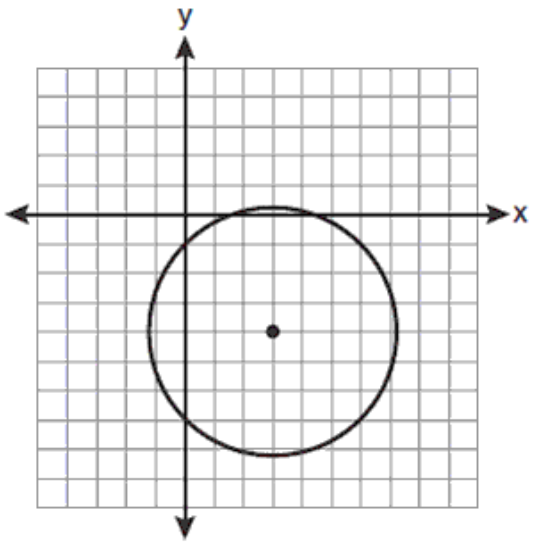


(b) Find the coordinates of the vertex and label it on your graph. Explain the meaning of the vertex within the given context. [3]

(c) How long will it take for the ball to hit the ground? Round to the nearest tenth. [4]

Circles

17. Which equation represents the circle shown in the graph below that passes through the point $(0,-1)$?



(1) $(x-3)^2+(y+4)^2=16$
(2) $(x-3)^2+(y+4)^2=18$
(3) $(x+3)^2+(y-4)^2=16$
(4) $(x+3)^2+(y-4)^2=18$

18. Find the length of the diameter of the circle $x^2+y^2-14x+40=0$.

19. Write the equation of a circle, in standard form, with a diameter whose endpoints are $\left(2\sqrt{2},3\sqrt{10}\right)$ and $\left(-4\sqrt{2},5\sqrt{10}\right)$.

(1) $\left(x+\sqrt{2}\right)^2+\left(y+4\sqrt{10}\right)^2=\sqrt{28}$
(2) $\left(x+\sqrt{2}\right)^2+\left(y-4\sqrt{10}\right)^2=28$
(3) $\left(x+\sqrt{2}\right)^2+\left(y-\sqrt{40}\right)^2=28$
(4) $\left(x-\sqrt{2}\right)^2+\left(y+4\sqrt{10}\right)^2=\sqrt{28}$

Rational Expressions & Functions

20. Describe how to determine if a relation is a function or not. In addition, describe how we can tell if a function is one-to-one. Provide specific examples where necessary.

21. Which function shown below has a greater average rate of change on the interval [−2,4]? Justify your answer.

x	f(x)
−4	0.3125
−3	0.625
−2	1.25
−1	2.5
0	5
1	10
2	20
3	40
4	80
5	160
6	320

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

22. Express the following rational expression in simplest form: $\frac{9-x^2}{10x^2-28x-6}$

(1) $\frac{3-x}{10x+2}$

(2) $\frac{3+x}{10x+2}$

(3) $\frac{-3-x}{10x+2}$

(4) $\frac{3-x}{10x-2}$

23. Given $g(x)=\frac{3x-7}{10-4x}+1$; solve for g($x$) = 0.

<u>Exponentials</u>

24. Describe the difference in how linear functions and exponential functions change as the values of x increase by 1. Provide a table of values to support your statement.

25. The expression $\frac{(4x^3)^2}{2x}$ is equivalent to which of the following

(1) $4x^4$ (3) $4x^5$

(2) $8x^4$ (4) $8x^5$

26. If $10^k = x$, then 10^{3k} is equal to

(1) x^3 (3) $3 + x$

(2) $3x$ (4) $1{,}000x$

27. The expression $\frac{\left(b^{2n+1}\right)^3}{b^n \cdot b^{4n+3}}$ is equivalent to which of the following

(1) $4x^4$ (3) $4x^5$

(2) $8x^4$ (4) $8x^5$

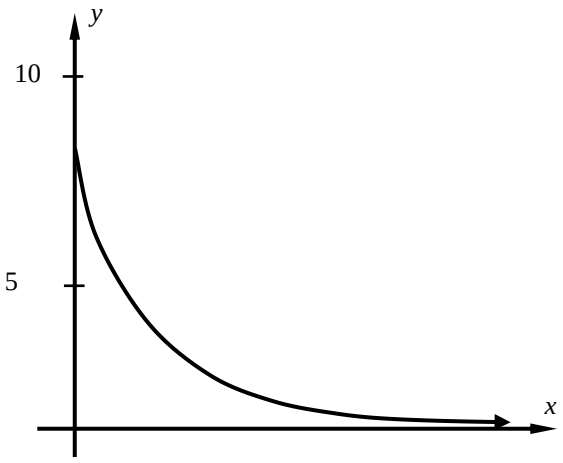
28. Which of the following could be the equation of the exponential function shown below?

(1) $y = 3(0.9)^x$

(2) $y = 7(1.2)^x$

(3) $y = 8(0.5)^x$

(4) $y = 4(2.5)^x$



29. Simplify the following expression. Include only positive exponents.

$$\frac{(2x^3y^2)^4(8x^4)}{4y^{10}(x^5)^7}$$

30. If the function $g(x) = ab^x$ represents exponential growth, which statement about $g(x)$ is false?

(1) $a > 0$ and $b > 1$
(2) The x-intercept is $(b, 0)$.
(3) The y-intercept is $(0, a)$.
(4) The asymptote is $y = 0$.

31. The number of new visits to a website is decreasing exponentially. It can be modeled by the function $h(d) = 2170(0.92)^d$, where h is the number of new site hits and d is the number of days since the site opened. Which of the following is the average rate of change of h over the interval $2 \le d \le 4$?

(1) -141 hits per day
(2) -282 hits per day
(3) 71 hits per day
(4) 210 hits per day

32. What is the range of $f(x) = 2(2.5)^x - 2$

(1) $(-\infty, \infty)$
(2) $(2, \infty)$
(3) $[-2, \infty)$
(4) $(-2, \infty)$

33. The population of Ashmore was 925 in 2000 and 1028 in 2001. The linear model for Ashmore's population is $P = 103t + 925$, where *t* is the years since 2000. [4]

(a) Find an exponential model, in the form $P = a(b)^t$, for Ashmore's population *t*-years after 2000. Round *b* to the nearest *thousandth*.

(b) How much greater is the population predicted by the exponential model than that predicted by the linear model for the year 2015?

Systems of Equations

34. A rectangular plot of land has a perimeter of 40 feet and an area of 96 square feet. Algebraically, find the dimensions of the plot.

35. Which of the following are some of the points of intersection for the system of equations

$$\begin{cases} y+4=x^2 \\ 5x^2-2y^2=20 \end{cases}$$

(1) $\left(-\frac{\sqrt{26}}{2},\frac{5}{2}\right),(-2,0)$

(2) $\left(0,\frac{5}{2}\right),\left(0,-\frac{5}{2}\right)$

(3) $(0,-2),\left(\frac{5}{2},\frac{\sqrt{26}}{2}\right)$

(4) $(0,2),\left(\frac{5}{2},-\sqrt{26}\right)$

36. Solve the following system of equations algebraically for all values of *x*, *y*, and *z*.

$-x - 7y + 3z = -32$
$2x + 3y - 5z = 33$
$-5x - 5y + 7z = -57$

Trigonometry

37. Express 160° in radian measure.

38. Express $\frac{7\pi}{3}$ in degrees.

39. An electron travels along a circular path with a radius of 4.6 miles. What is the number of miles the electron traveled during an interval when the central angle formed by the electron's path was 220°?

(1) 3.84
(2) 8.83
(3) 17.66
(4) 1012

40. A farmer has determined that a crop of strawberries yields a yearly profit of $1.50 per square yard. If strawberries are planted on a triangular piece of land whose sides are 50 yards, 75 yards, and 100 yards, how much profit, to the *nearest hundred dollars*, would the farmer expect to make from this piece of land during the next harvest?

41. Carmen and Jamal are standing 5,280 feet apart on a straight, horizontal road. They observe a hot-air balloon between them directly above the road. The angle of elevation from Carmen is 60° and from Jamal is 75°. Find the height of the balloon to the *nearest foot*.

42. Two forces of 28 pounds and 41 pounds act on a body so that the angle between the two forces measures 72^{o}. Find, to the nearest tenth of a pound, the magnitude of the resultant the forces produce.

Radicals

43. Which value is equivalent to the product of $4\sqrt{2}$ and $2\sqrt{6}$?

(1) $16\sqrt{3}$
(2) $6\sqrt{12}$
(3) $6\sqrt{8}$
(4) $24\sqrt{2}$

44. The expression $\left(2-3\sqrt{x}\right)^2$ is equivalent to

(1) $4-9x$
(2) $4-3x$
(3) $4-12\sqrt{x}+9x$
(4) $4-12\sqrt{x}+6x$

45. For all values for which the function is defined, the expression $\sqrt{\frac{a}{bc}}$ is equivalent to

(1) $\sqrt{a}$
(2) $\frac{a\sqrt{bc}}{bc}$
(3) $\frac{\sqrt{abc}}{bc}$
(4) $\sqrt{abc}$

46. The expression $4ab\sqrt{2b} - 3a\sqrt{18b^3} + 7ab\sqrt{6b}$ is equivalent to:

(1) $2ab\sqrt{6b}$
(2) $16ab\sqrt{2b}$
(3) $-5ab + 7ab\sqrt{6b}$
(4) $-5ab\sqrt{2b} + 7ab\sqrt{6b}$

47. The expression $\frac{3-\sqrt{8}}{\sqrt{3}}$ is equivalent to

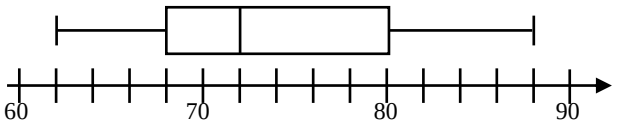
(1) $\frac{\sqrt{3}-2\sqrt{6}}{3}$
(2) $-\sqrt{3}+\frac{2}{3}\sqrt{6}$
(3) $\frac{3-\sqrt{24}}{3}$
(4) $\sqrt{3}-\frac{2}{3}\sqrt{6}$

48. The sum of $\sqrt[3]{6a^4b^2}$ and $\sqrt[3]{162a^4b^2}$, expressed in simplest radical form, is

(1) $\sqrt[6]{168a^8b^4}$
(2) $2a^2b\sqrt[3]{21a^2b}$
(3) $4a\sqrt[3]{6ab^2}$
(4) $10a^2b\sqrt[3]{8}$

Statistics

49. The distribution of scores on a recent physics quiz is shown in the box plot below. Which of the following gives the interquartile range of the data?



(1) 12 (3) 26

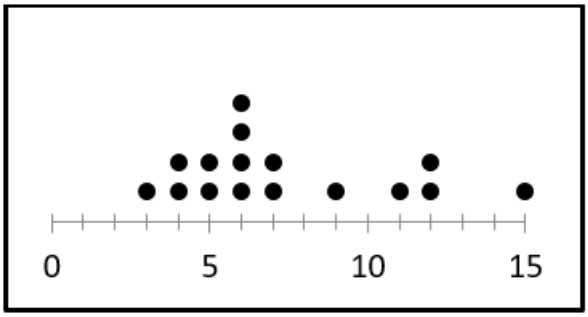
(2) 72 (4) 88

50. Which correlation coefficient below shows the *least* amount of association between the two variables?

(1) $r = 0.92$ (3) $r = -0.98$

(2) $r = -0.54$ (4) $r = 0.28$

51. What is the median of the data shown in the dot plot below?



(1) 5 (3) 8

(2) 6 (4) 9

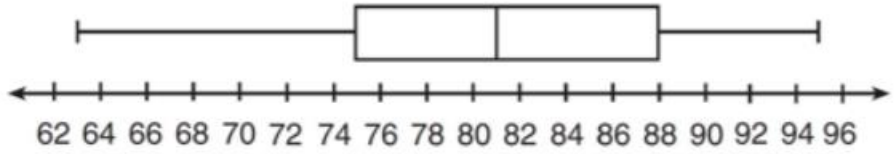
52. Which of the following is closest to the sample standard deviation of the data set shown below?

$\{13, 14, 17, 22, 26, 30, 31\}$

(1) 5.2 (3) 7.4

(2) 6.1 (4) 8.3

53. The box-and-whisker plot below represents a set of grades in a college statistics class.



Which interval contains exactly 50% of the grades?

(1) 63 - 88

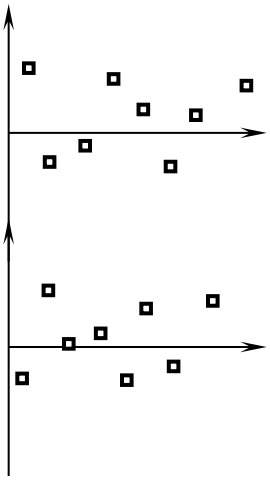
(2) 63 - 95

(3) 75 - 81

(4) 75 - 88

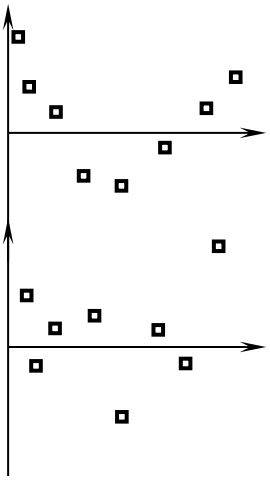
54. Which residual plot below indicates a model that is an inappropriate choice?

(1)



(2)

(3)



(4)

55. The number of views of a video on the internet is shown in the table below as a function of the time since the video was posted (in hours).

Number of hours, x	2	5	8	12	17	20
Number of views, y	650	1,280	2,140	3,120	4,050	4,920

(a) Find a linear regression equation, in the form $y = ax + b$, that best fits this data set. Round each parameter to the nearest whole number. [2]

(b) State the correlation coefficient to 3 decimal places and describe the correlation between the variables. Justify your response. [2]

(c) Based on the model you wrote in (a), how many views would the video have **two days** after it was posted? Show your thinking. [2]

(d) Graph the residuals on your calculator. Is the linear model a good fit for this data? Justify your answer. [2]

56. Krazy Cream is trying to determine if there is an association between age and ice cream flavor preference. They surveyed 50 people who were in their 20's, 30's, and 40's and asked if they preferred vanilla, chocolate, or strawberry ice cream. The results are as follows:

		Ice Cream Preference			
		Vanilla	Chocolate	Strawberry	Total
Age Range	20's	2	9	3	14
	30's	4	14	2	20
	40's	8	4	4	16
	Total	14	27	9	50

a) Are 30 year olds more likely to pick chocolate as their favorite ice cream compared to all people surveyed? Support your answer. [2]

b) What is more likely, that someone in their 40's will prefer vanilla or that someone who prefers vanilla will be in their 40's? [3]

57. Conclusion: After answering the previous questions, which sections were easiest for you? Which parts were most challenging? Is there something you know about algebra (not Geometry) that wasn't asked in the previous questions? If so, describe what those concepts are.