

Name: _____ Date: _____

Advanced Functions - Review for Final Exam: Packet # 1 (Released Items)

Multiple Choice: Choose the letter that best answers each question or completes each problem.

1. The table below shows the probability distribution of the number of televisions in each house in a community.

Televisions	Probability
0	0.04
1	0.38
2	0.27
3	x
4	y
5 or more	0.13

What is the probability that a house in the community will have at least 3 televisions?

- a. 0.69 b. 0.31 c. 0.18 d. 0.09
2. Anna and Zach each have \$600 to invest. Anna's investments earn a rate of 10.5% and Zach's investment earn a rate of 6.5%. Approximately, how much more will Anna have than Zach when Zach's investments are worth \$900. (Assume continuous compounding.)
- a. \$184 b. \$241 c. \$255 d. \$264
3. A solution's pH is given by the function $pH = -\log(t)$, where t is the hydronium ion concentration, in moles per liter. A sample of coffee has a pH of 5.0. What is the approximate hydronium ion concentration of the sample?
- a. 0.000001 b. 0.00001 c. 0.0001 d. 0.001
4. A sequence is given: 1, 0.1, 0.01, 0.001, 0.0001, ...
What is the sum of the sequence?
- a. $1\frac{1}{10}$ b. $1\frac{1}{9}$ c. $1\frac{2}{9}$ d. $1\frac{9}{10}$
5. Which statement is true about the given sequence: 0, 4.5, 12, 22.5, ...?
- a. The series converges because the limit of the sequence as n approaches infinity is infinity.
- b. The series converges because the limit of the sequence as n approaches infinity is 30.
- c. The series diverges because the limit of the sequence as n approaches infinity is infinity.
- d. The series diverges because the limit of the sequence as n approaches infinity is 30.
6. A pharmaceutical company is creating a new cholesterol drug prevent heart disease. The company must collect data by testing the drug before it is approved. Which would be the best method of data collection?
- a. experimental study c. simulation
- b. observational study d. survey

7. The table below shows the midterm and final exam grades of ten students.

Midterm	68	78	92	90	88	82	94	83	71	62
Final Exam	62	77	99	87	85	84	95	98	72	64

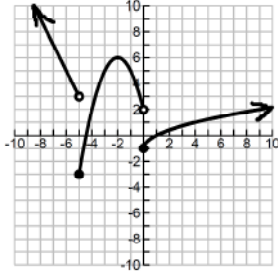
Which comparison between the midterm grades and the final exam grades is true?

- The final exam grades have a higher mean and standard deviation than the midterm grades.
 - The final exam grades have a lower mean and standard deviation than the midterm grades.
 - The final exam grades have a higher mean and a lower standard deviation than the midterm grades.
 - The final exam grades have a lower mean and a higher standard deviation than the midterm grades.
8. A baseball team scored the following number of runs in its game this season: 6, 2, 5, 9, 11, 4, 5, 8, 6, 7, 5. There is one more game in the season. If the team wants to end the season with an average of at least 6 runs per game, what is the least number of runs the team must score in the final game of the season?
- 2
 - 4
 - 6
 - 8
9. If the probability of giving birth to a boy is 0.52, what is the approximate probability of giving birth to four consecutive boys?
- 0.021
 - 0.062
 - 0.073
 - 0.130
10. How many more ways can 10 juniors running for the positions of president, vice president, secretary, and treasurer be selected when compared to 12 sophmores running for 5 identical positions of class representative?
- 94,830
 - 11,628
 - 4,320
 - 4,248
11. A starting line for a hockey team should consist of 3 offensive players, 2 defensive players, and 1 goaltender. A coach has 11 offensive players, 6 defensive players, and 2 goaltenders from which to choose the starting line. How many unique starting lines can the coach create?
- 132
 - 792
 - 4,950
 - 59,400
12. It costs a bakery \$3.50 to make apple pies that sell for \$12 the first day they are baked.
- If a pie is not sold on the first day, the new price is \$8.50.
 - The probability of selling the apple pie the first day is 75%.
 - There is a 12% probability of selling it on the second day.
 - If the apple pie does not sell by the end of the second day, it is donated.
- What is the approximate expected profit per pie for the bakery on the sale of its apple pies?
- \$5.67
 - \$6.52
 - \$9.57
 - \$10.02
13. The number of household members, x , living in Cityville homes has the following probability distribution:
- | | | | | | | | | |
|--------------|------|------|------|------|------|------|------|------|
| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| P (x) | 0.21 | 0.28 | 0.16 | 0.22 | 0.06 | 0.04 | 0.02 | 0.01 |
- What is the expected size of a household in Cityville?
- 2.43
 - 2.89
 - 3.17
 - 4.50
14. What is the middle term for the expansion of $(x^2 + 3)^{12}$?
- $729x^{12}$
 - $924x^{12}$
 - $673,596x^{12}$
 - $665,280x^{12}$
15. Abby took an 8-question multiple-choice quiz. Suppose that her probability of correctly answering any question is 0.75. What is Abby's probability of incorrectly answering exactly two questions on the quiz?
- $P = 0.089$
 - $P = 0.240$
 - $P = 0.311$
 - $P = 0.623$

16. Which function results by shifting the graph of $y = \ln(x+3) - 6$ to the left 4 units and down 3 units?

- a. $y = \ln(x+7) - 9$ c. $y = \ln(x+7) - 3$
 b. $y = \ln(x-1) - 9$ d. $y = \ln(x-1) - 3$

17. Which piecewise function is graphed below?



a.

$$f(x) = \begin{cases} -2x-7 & \text{if } x < -5 \\ -(x+2)^2 + 6 & \text{if } -5 \leq x < 0 \\ \sqrt{x}-1 & \text{if } x \geq 0 \end{cases}$$

b.

$$f(x) = \begin{cases} -2x-7 & \text{if } x < -5 \\ -(x-2)^2 + 6 & \text{if } -5 \leq x < 0 \\ \sqrt{x}-1 & \text{if } x \geq 0 \end{cases}$$

c.

$$f(x) = \begin{cases} -2x-7 & \text{if } x < -5 \\ -(x-2)^2 + 6 & \text{if } -5 < x \leq 0 \\ \sqrt{x}-1 & \text{if } x > 0 \end{cases}$$

d.

$$f(x) = \begin{cases} -2x-7 & \text{if } x < -5 \\ -(x+2)^2 + 6 & \text{if } -5 < x \leq 0 \\ \sqrt{x}-1 & \text{if } x > 0 \end{cases}$$

18. A function, $f(x)$, is shown below.

$$f(x) = \begin{cases} x-4 & \text{if } 0 \leq x < 2 \\ x^2 - 3x + 4 & \text{if } 2 \leq x < 4 \\ 5 & \text{if } 4 \leq x < 7 \end{cases}$$

What is the range of the function $f(x)$?

- a. $[-4, 5)$ c. $[-4, -2) \cup [2, 5)$
 b. $[-4, 8)$ d. $[-4, -2) \cup [2, 8)$

19. A water tower is located 410 feet from a building. From a window in the building, it is observed that the angle of elevation to the top of the tower is 42 degrees and the angle of depression to the bottom of the tower is 25 degrees. Approximately how tall is the water tower?

- a. 191 feet b. 369 feet c. 448 feet d. 560 feet

20. Given the table below:

x	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$
y	0.5	0	-0.5	0	0.5

Which function fits the data?

- a. $y = 0.5\cos(2x - \pi)$ c. $y = 0.5\cos\left(2x + \frac{\pi}{2}\right)$
 b. $y = 0.5\cos(x - \pi)$ d. $y = \cos\left(2x + \frac{\pi}{2}\right)$

21. A Ferris Wheel has a diameter of 80 feet. Riders enter the Ferris Wheel at its lowest point, 5 feet above the ground, at time $t = 0$ seconds. One complete rotation takes 65 seconds. Which function models a rider's vertical height, $h(t)$, at t seconds?
- a. $h(t) = -80\cos\left(\frac{2\pi}{65}t\right) + 5$ c. $h(t) = -45\cos\left(\frac{65}{2\pi}t\right) + 40$
- b. $h(t) = -40\cos\left(\frac{2\pi}{65}t\right) + 45$ d. $h(t) = -5\cos\left(\frac{65}{2\pi}t\right) + 80$
22. How does the graph of $g(x) = 0.5\cos(2x)$ differ from the graph of its parent function, $f(x) = \cos(x)$, over the interval $-\pi \leq x \leq \pi$?
- a. The amplitude is smaller, and the period is shorter.
b. The amplitude is smaller, and the period is longer.
c. The amplitude is larger, and the period is shorter.
d. The amplitude is larger, and the period is longer.
23. Two sides of a triangle measure 14 feet and 17 feet, respectively. The included angle is 72° . Approximately how long is the third side of the triangle?
- a. 18.4 feet b. 20.3 feet c. 25.1 feet d. 30.7 feet
24. In a geometric sequence, $a_1 = 12$ and $r = \sqrt{2}$. What is the approximate sum of the first 20 terms of the sequence?
- a. 339.4 b. 8,688.9 c. 29,624.9 d. 29,636.9
25. A bathroom floor has tiles arranged in 9 circles. The innermost circle contains 9 tiles. Each successive circle contains 9 more tiles than the previous circle. How many total tiles are on the bathroom floor?
- a. 81 b. 396 c. 405 d. 729
26. Suppose the function $H(t) = 8.5\sin(0.017t - 1.35) + 12$ models the hours of sunlight for a town in Alaska, where $t = 1$ is the first day of the year. Based on the function, what is the approximate range of daylight hours for the town?
- a. 3.5 to 20.5 b. 4 to 20 c. 4.5 to 19.5 d. 5 to 19
27. The lifetime of a particular type of car tire is normally distributed. The mean lifetime is 50,000 miles, with a standard deviation of 5,000 miles. Of a random sample of 15,000 tires, how many of the tires are expected to last between 45,000 and 55,000 miles?
- a. 7,125 b. 10,200 c. 14,250 d. 14,850

28. The frequency table below shows the number of runners in specific age groups for a certain race.

Age Group	0 – 10	11 – 20	21 – 30	31 – 40	41 – 50	51 – 60	61 – 70	71 – 80	81 – 90
Number of Runners	••	•	••••• ••••• ••	••••• •	•••••	•	••	•	••

What is the shape of the distribution?

- a. uniform b. skewed right c. skewed left d. normal

29. A spinner labeled 1 to 9 gives each of the numbers 2, 5, 7, and 9 a $\frac{3}{20}$ chance of being landed upon. The chance of landing on each of the other five numbers is equal. If the spinner is spun 1,000 times, which choice is the most likely outcome for the 1,000 spins?

a.

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	110	112	111	111	109	112	112	111	112

b.

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	82	148	78	80	149	79	151	81	152

c.

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	120	122	100	103	108	126	113	104	104

d.

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	121	100	119	120	102	120	98	121	99

30. A group of 12 people need to form a line. The line will consist of exactly 9 of the people. Person X and Person Y have to be either third or fourth in line. How many different orders are possible?

a. 79,833,600 b. 1,209,600 c. 604,800 d. 362,880

31. The probability that it will rain on Saturday is $\frac{2}{3}$. The probability that the temperature of Saturday will reach 100°F is $\frac{4}{9}$. The probability that it will rain or reach 100°F on Saturday is $\frac{4}{5}$. What is the probability it will rain and reach 100°F on Saturday?

a. $\frac{14}{45}$ b. $\frac{16}{45}$ c. $\frac{24}{45}$ d. $\frac{26}{45}$

32. A manufacturing plant produces a special kind of lightbulb.

- Each lightbulb produced has a 0.040 probability of being defective.
- Five lightbulb are chosen at random from the production line.

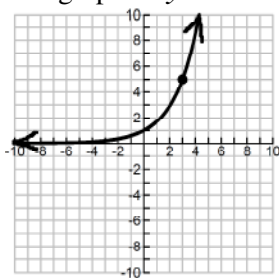
To the nearest thousandth, what is the probability that exactly two of the five bulbs will be defective?

a. 0.014 b. 0.016 c. 0.018 d. 0.020

33. What is the meaning of the base of the function $y = -\log(x)$?

- a. As y decreases by 1, x increases by a factor of 10.
b. As y decreases by 1, x increases by 10.
c. As y increases by 1, x increases by a factor of 10.
d. As y increases by 1, x increases by 10.

34. The graph of $y = a^x$ is shown below.



Which choice is closest to $\log_a 3$?

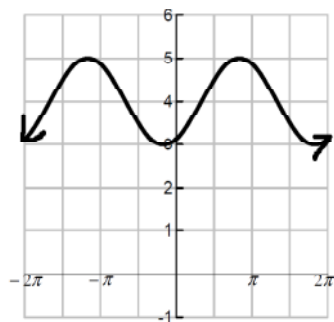
- a. 0.9 b. 2.1 c. 3.2 d. 4.8
35. A piecewise function is shown below.

$$h(x) = \begin{cases} -2x^2 + 5x + 10 & \text{if } -4 \leq x < 3 \\ 2x + 3p & \text{if } 3 \leq x \leq 5 \end{cases}$$

For what value of p will the function be continuous?

- a. $\frac{10}{3}$ b. $\frac{1}{3}$ c. $-\frac{25}{3}$ d. $-\frac{34}{3}$
36. The equation $y = 4.7x^{\frac{1}{6}}$ is graphed on the coordinate plane. How does increasing the denominator of the exponent transform the graph?
- a. The transformed graph will approach a horizontal asymptote while the original graph will not.
- b. The transformed graph will not approach a horizontal asymptote while the original graph will.
- c. The transformed graph will go to ∞ slower than the original graph as the value of x gets larger.
- d. The transformed graph will go to ∞ faster than the original graph as the value of x gets larger.

37. Which function correctly represents the graph below?



- a. $y = \sin\left(x - \frac{\pi}{3}\right) + 4$ c. $y = \cos\left(x - \frac{\pi}{3}\right) + 4$
- b. $y = \sin\left(x + \frac{\pi}{3}\right) + 4$ d. $y = \cos\left(x + \frac{\pi}{3}\right) + 4$

38. Which function has an amplitude that is twice the size and a period that is three times the size of the function $y = 3\cos\left(\frac{x}{4} - 1\right) + 2$?
- a. $y = 6\sin\left(\frac{x}{12} - 3\right) + 1$ c. $y = 6\cos\left(\frac{3x}{4} - 1\right) + 3$
- b. $y = \frac{3}{2}\cos\left(\frac{3x}{4} + 1\right) - 3$ d. $y = \frac{3}{2}\sin\left(\frac{x}{12} + 3\right) - 1$
39. A plane takes off and travels at angle of 40° north of east at 110 mph for 2 hours. It then adjusts its path to head 10° west of north and travels in that direction for half an hour at a speed of 100 mph. Approximately how far away is the plane from its starting point?
- a. 182 miles b. 200 miles c. 238 miles d. 249 miles
40. Which statement is true about the fifth terms of the two sequences below?
- $a_n = 3n^2 - 6$
 $b_n = 3(b_{n-1} - 6); b_1 = 10$
- a. The fifth term of the recursive sequence exceeds the fifth term of the explicit sequence by 63. c. The fifth term of the recursive sequence exceeds the fifth term of the explicit sequence by 21.
- b. The fifth term of the explicit sequence exceeds the fifth term of the recursive sequence by 63. d. The fifth term of the explicit sequence exceeds the fifth term of the recursive sequence by 21.
41. Which statement is true about the series shown below?
- $-4 + -2 + -1 + -\frac{1}{2} + -\frac{1}{4} + \dots$
- a. The series converges because $|r| < 1$. c. The series converges because $|r| > 1$.
- b. The series diverges because $|r| < 1$. d. The series diverges because $|r| > 1$.
42. What is the explicit form of the equation $a_n = a_{n-1} + 2(n-1); a_1 = 1$?
- a. $a_n = 2n - 1$ c. $a_n = n^2 - 2n + 2$
- b. $a_n = n^2 - n + 1$ d. $a_n = 2n^2 - 2n - 1$
43. An investor bought 1,500 shares of a stock for \$6 a share. He estimates the probability that the stock will rise to a value of \$25 a share is 24%, and the probability it will fall to a \$2 a share is 76%. What is the expected value of the investor's profit from buying the stock?
- a. \$13,560 b. \$9,120 c. \$6,720 d. \$2,280
44. A Ferris Wheel is designed in such a way that the height (h), in feet, of the seat above the ground at any time, t, is modeled by the function $h(t) = 60 - 55\sin\left(\frac{\pi}{10}t + \frac{\pi}{2}\right)$. What is the maximum height a seat reaches?
- a. 55 feet b. 60 feet c. 110 feet d. 115 feet

45. A teacher counts the final exam as 25% of each student's class grade. The remaining 75% is the mean of the student's test scores from the semester. Jaleesa's test scores for the semester are 86, 90, 92, and 80. What is the minimum score Jaleesa must get on the final exam to have a class grade of 85.0 or higher?
- a. 77 b. 79 c. 81 d. 83
46. Two sides of a triangle measure 10 inches and 13 inches. The included angle between these sides is 55° . What is the approximate measure of the third side of the triangle?
- a. 10.9 inches b. 11.2 inches c. 13.9 inches d. 16.2 inches
47. The third term of a geometric sequence is 96, and the fifth term is 1,536. What is the sum of the first ten terms of this sequence?
- a. 4,092 b. 1,572,864 c. 2,097,150 d. 33,554,400

Short Answer: Complete each problem and its parts (if any). Must show work!

48. The table below shows the estimated average hours each person in a city spent playing video games in different years:

Years Since 2002	Hours
0	71
1	80
2	82
3	78
4	80
5	91
6	107
7	121
8	125
9	131
10	142

- a.) Write an equation for the best fit exponential model for the data.
- b.) What is the meaning of the base of the model in the context of the problem?
- c.) What is the meaning of the coefficient of the model in the context of the problem?
49. Students are told that attending class regularly will help improve their scores in that class. Below are the scores for students who did attend class regularly and scores for those who did not.

Attended Class Regularly				
241	261	271	282	296
243	262	272	284	296
254	267	278	292	308
252	264	276	290	310

Did Not Attend Class Regularly			
185	195	195	228
250	256	225	261
274	277	308	233

- a.) Which group of students has a larger mean score and by how much?
- b.) Which group of students has a larger median score and by how much?
50. a.) Write an equation for the power function, in $y = ax^b$ form, that passes through the points (2, 1) and (5, 6).
- b.) Using power function above, use it to predict the value of y when x = 9.