Identify the answer choice that best answers the question.

_____1. Solve the equation $x^2 - 9x + 20 = 0$
   a. $x = 4, -5$  
   b. $x = 4, 5$  
   c. $x = -4, 5$  
   d. $x = -4, -5$

_____2. Simplify $\sqrt{25x^{20}y^{14}}$
   a. $5x^{10}y^{7}$  
   b. $12.5x^{20}y^{14}$  
   c. $5x^{20}y^{14}$  
   d. $12.5x^{10}y^{7}$

_____3. A bookstore offers a collection of books. A student can select from one of 6 algebra books, one of 4 geometry books, and one of 3 calculus books. How many different possibilities are available for that collection?
   a. 48  
   b. 30  
   c. 36  
   d. 72

_____4. How many ways can the top 5 teams be arranged in a league containing 21 teams?
   a. 15,504  
   b. 143,640  
   c. 2,441,880  
   d. 1,860,480

_____5. In a race between 21 people, how many ways can the top 6 finishers be arranged?
   a. 39,070,080  
   b. 54,264  
   c. 27,907,200  
   d. 2,441,880

_____6. In how many different orders can you line up 8 cards on a table?
   a. 8  
   b. 1  
   c. 1,680  
   d. 40,320

_____7. There are 10 students participating in a spelling bee. In how many ways can the students who go first and second in the bee be chosen?
   a. 1 way  
   b. 90 ways  
   c. 3,628,800 ways  
   d. 45 ways

_____8. Lynn and Dawn tossed a coin 40 times and got heads 25 times. What is the experimental probability of tossing heads using Lynn and Dawn’s results?
   a. $\frac{3}{5}$  
   b. $\frac{3}{8}$  
   c. $\frac{3}{8}$  
   d. $\frac{5}{8}$

_____9. Find the standard deviation for the data: 5, 6, 8, 11, 10.
   a. 3.28  
   b. 1.28  
   c. 2.28  
   d. 4.28

_____10. What is the theoretical probability of being dealt exactly three 4s in a 5-card hand from a standard deck of 52 cards?
   a. $\frac{2162}{54145}$  
   b. $\frac{2}{759}$  
   c. $\frac{2}{33}$  
   d. $\frac{759}{54145}$

_____11. If a dart hits the target shown at random, what is the probability that it will land in the shaded region?
   a. $\frac{1}{4}$  
   b. $\frac{1}{16} \pi$  
   c. $\frac{1}{16}$  
   d. $16 \pi$

_____12. The probability that a city bus is ready for service when needed is 85%. The probability that a city bus is ready for service and has a working radio is 67%. Find the probability that a bus chosen at random has a working radio given that it is ready for service. Round to the nearest tenth of a percent.
   a. 12.7%  
   b. 18.0%  
   c. 82.8%  
   d. 78.8%

_____13. A class of 40 students has 11 honor students and 10 athletes. Three of the honor students are also athletes. One student is chosen at random. Find the probability that this student is an athlete if it is known that the student is not an honor student. Round to the nearest thousandth.
   a. 0.345  
   b. 0.034  
   c. 0.252  
   d. 0.241

_____14. The numbers of cookies in a shipment of bags are normally distributed, with a mean of 64 and a standard deviation of 4. What percent of bags of cookies will contain between 60 and 68 cookies?
   a. 50%  
   b. 13.5%  
   c. 34%  
   d. 68%

_____15. Find the coefficient of the $x^3y^2$ term in the expansion of $(5x - 4y)^5$.
   a. 60  
   b. 20,000  
   c. 2,000  
   d. 120,000
16. Use the Binomial Theorem to expand \((6x - b)^5\).
   a. \(7776x^5 + 6480x^4b + 2160x^3b^2 + 360x^2b^3 + 30xb^4 + b^5\)
   b. \(7776b^5 + 6480xb^4 + 2160x^2b^3 + 360x^3b^2 + 30xb^4 + x^5\)
   c. \(x^5 - 5x^4b + 10x^3b^2 - 10x^2b^3 + 5xb^4 - b^5\)
   d. \(7776x^5 - 6480x^4b + 2160x^3b^2 - 360x^2b^3 + 30xb^4 - b^5\)

17. Find the variance and standard deviation for the given set of data to the nearest tenth.
   \{5.1, 14.5, 22.7, 34.3, 22, 41.8, 18.3, 46, 15, 61.8\}
   a. Variance = 16.5; SD = 273
   b. Variance = 303.4; SD = 17.4
   c. Variance = 273; SD = 16.5
   d. Variance = 273; SD = 136.5

18. Find the range of the data shown on the box-and-whisker plot.

   a. 46    c. 61
   b. 49    d. 31

19. Find the upper quartile of the data shown on the box-and-whisker plot.

   a. 42    c. 56
   b. 73    d. 31

20. Find the lower quartile of the data shown on the box-and-whisker plot.

   a. 38    c. 27
   b. 16    d. 21

21. You buy a raffle ticket for $2. If your ticket is selected from the 500 sold, you will win $750. What is the expected value of your net gain?
   a. $-0.75    c. $-0.25
   b. $-0.50    d. $0.50

22. Solve: \(\sqrt{x + 9} = x - 3\)
   a. 7    c. -3, 4
   b. -6    d. no real solution

23. Describe the set of numbers using interval notation: \(x > 12\) or \(x \leq 8\).
   a. \([8, 12)\)
   b. \((-\infty, 8) \cap (12, \infty)\)
   c. \((-\infty, 8] \cup (12, \infty)\)
   d. \((-\infty, 8) \cup (12, \infty)\)

24. Determine the domain of the function \(h(x) = \frac{8x}{x(x^2 - 81)}\)
   a. \(\{x | x \neq \pm 9\}\)
   b. \(\{x | x \neq \pm 81, x \neq 0\}\)
   c. \(\{x | x \neq 9\}\)
   d. \(\{x | x \neq 9, x \neq 0\}\)

25. Describe the end behavior of the function \(f(x) = 1 - 2x^2 - 3x^3\).
   a. \(\lim_{x \to -\infty} f(x) = -\infty\) and \(\lim_{x \to \infty} f(x) = -\infty\)
   b. \(\lim_{x \to -\infty} f(x) = -\infty\) and \(\lim_{x \to \infty} f(x) = \infty\)
   c. \(\lim_{x \to -\infty} f(x) = \infty\) and \(\lim_{x \to \infty} f(x) = -\infty\)
   d. \(\lim_{x \to -\infty} f(x) = \infty\) and \(\lim_{x \to \infty} f(x) = \infty\)

26. Describe the end behavior of the function \(h(x) = -2x^4\).
   a. \(\lim_{x \to -\infty} h(x) = -\infty\) and \(\lim_{x \to \infty} h(x) = -\infty\)
   b. \(\lim_{x \to -\infty} h(x) = -\infty\) and \(\lim_{x \to \infty} h(x) = \infty\)
   c. \(\lim_{x \to -\infty} h(x) = \infty\) and \(\lim_{x \to \infty} h(x) = -\infty\)
   d. \(\lim_{x \to -\infty} h(x) = \infty\) and \(\lim_{x \to \infty} h(x) = \infty\)

27. Which statement describes a method that can be used to sketch the graph of \(y = |x| + 1\)?
   a. Translate the graph of \(y = |x|\) one unit right.
   b. Translate the graph of \(y = |x|\) one unit left.
   c. Translate the graph of \(y = |x|\) one unit up.
   d. Translate the graph of \(y = |x|\) one unit down.
AFM – Final Exam Review PART 2
Identify the answer choice that best answers the question.

28. Use a power function to model the data and estimate y for x = 10.

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>9</td>
<td>144</td>
<td>729</td>
<td>2,304</td>
<td>6,625</td>
<td>11,664</td>
<td>21,609</td>
<td>36,864</td>
</tr>
</tbody>
</table>

a. 59,049  
b. 131,769  
c. 90,000  
d. 52,119

29. Solve: \( \sqrt{x^2 + 2} + 1 = \sqrt{8x + 4} \)

a. –0.27  
b. –26.27 and 0.27  
c. 26.27 and –0.27  
d. 26.27

30. Determine the zeros and the end behavior of \( f(x) = -x(x - 4)(x + 5)^4 \).

a. \( x = 0, 4, -5 \) (multiplicity of 4)  
\( \lim_{x \to -\infty} f(x) = -\infty \) and \( \lim_{x \to \infty} f(x) = -\infty \)

b. \( x = 0, -4, 5 \) (multiplicity of 4)  
\( \lim_{x \to -\infty} f(x) = -\infty \) and \( \lim_{x \to \infty} f(x) = -\infty \)

c. \( x = 0, 4, -5 \) (multiplicity of 4)  
\( \lim_{x \to -\infty} f(x) = -\infty \) and \( \lim_{x \to \infty} f(x) = \infty \)

d. \( x = 0, -4, 5 \) (multiplicity of 4)  
\( \lim_{x \to -\infty} f(x) = -\infty \) and \( \lim_{x \to \infty} f(x) = \infty \)

31. Use the graph of \( f \) to describe the transformation that results in the graph of \( g \).

\( f(x) = e^x \) \( g(x) = -\frac{7}{8} e^{x+3} + 3 \)

a. \( g(x) \) is the graph of \( f(x) \) translated 3 units to the left, 3 units up, reflected in the x-axis, and compressed vertically by a factor of \( \frac{7}{8} \).

b. \( g(x) \) is the graph of \( f(x) \) translated 3 units to the right, 3 units up, reflected in the x-axis, and compressed vertically by a factor of \( \frac{7}{8} \).

c. \( g(x) \) is the graph of \( f(x) \) translated 3 units to the right, 3 units down, reflected in the x-axis, and compressed vertically by a factor of \( \frac{7}{8} \).

d. \( g(x) \) is the graph of \( f(x) \) translated 3 units to the left, 3 units down, reflected in the x-axis, and compressed vertically by a factor of \( \frac{7}{8} \).

32. Evaluate: \( \log 94 \)

a. 9.4  
b. 1.97  
c. 0.51  
d. 3.95

33. The world’s population is expected to grow at a rate of 1.3% per year until at least the year 2020. In 1994 the total population of the world was about 5,642,000,000 people. Use the formula \( P_n = P_0 e^{it} \) to predict the world’s population \( P_n \), \( n \) years after 1994, with \( P_0 \) equal to the population in 1994 and \( i \) equal to the expected growth rate. What is the world’s predicted population in the year 2020, rounded to the nearest million?

a. 12,632,000,000  
b. 7,911,000,000  
c. 7,549,000,000  
d. 7,317,000,000

34. If the Laffite family deposits $8500 in a savings account at 6.75% interest, compounded continuously, how much will be in the account after 25 years?

a. $227,338.93  
b. $45,950.57  
c. $38,094.36  
d. $38,720.02

35. Evaluate the expression: \( \log_3 \frac{1}{27} \)

a. \( -1/3 \)  
b. \( -3 \)  
c. \( 1/3 \)  
d. 3

36. Express the logarithm \( \log_{\frac{3125}{9}} \) in terms of \( \ln 3 \) and \( \ln 5 \).

a. \( 5 \ln 3 - 2 \ln 5 \)  
b. \( 3 \ln 2 - 5 \ln 5 \)  
c. \( 5 \ln 5 - 2 \ln 3 \)  
d. \( 5 \ln 5 - 3 \ln 2 \)

37. Solve: \( e^{4x} = 5.7 \)

a. 0.4030  
b. 0.4351  
c. 0.7559  
d. 0.7559

38. Solve: \( \log_9 (x^2 + 7) = \log_9 43 \)

a. \( \pm 36 \)  
b. \( \pm 6 \)  
c. \( \pm 6.56 \)  
d. \( \pm 5 \)
39. Solve: \( \ln(-2y + 5) - \ln(y + 4) = \ln(-11y - 2) \)
   a. \( x = -3.68, -0.32 \)
   b. \( x = 3.68, 0.32 \)
   c. infinite solutions
   d. no solution

40. Radioactive Iodine-129 decays over time into stable Xenon-129. The percent of I-129 remaining in several mineral samples can be used to calculate the radioactive half-life of I-129, based on the ages of the mineral samples determined by other “dating” techniques. The following table shows data on the percent of I-129 remaining in minerals of different ages.
   
<table>
<thead>
<tr>
<th>Age (billions of yrs)</th>
<th>2.0</th>
<th>3.5</th>
<th>4.2</th>
<th>4.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of original I-129</td>
<td>74</td>
<td>59</td>
<td>53</td>
<td>52</td>
</tr>
</tbody>
</table>

   a. i) \( y = 100(0.854)^x \)
      ii) \( y = 100e^{-0.158x} \)
      iii) 3.2 billion years
   b. i) \( y = 100(0.858)^x \)
      ii) \( y = 100e^{-0.153x} \)
      iii) 3.3 billion years
   c. i) \( y = 100(0.854)^x \)
      ii) \( y = 100e^{-0.158x} \)
      iii) 4.4 billion years
   d. i) \( y = 100(0.858)^x \)
      ii) \( y = 100e^{-0.153x} \)
      iii) 4.5 billion years

41. Find one positive and one negative angle coterminal with an angle of 126°.
   a. 486°, -234°
   b. 526°, -54°
   c. 486°, -36°
   d. 216°, -36°

42. Write \( \frac{\pi}{20} \) in degrees.
   a. 4.5°
   b. 90°
   c. 9°
   d. 9°π°

43. As automobiles age, the average miles traveled per gallon decreases. Determine the regression equation that best models the data.

\[
\begin{array}{|c|c|c|c|c|c|c|c|c|}
\hline
\text{Age (years)} & 1 & 3 & 5 & 7 & 9 & 11 & 13 & 15 \\
\hline
\text{MPG} & 35 & 34 & 33 & 31 & 28 & 26 & 23 & 18 \\
\hline
\end{array}
\]
   a. Power
   b. Logarithmic
   c. Quadratic
   d. Exponential

44. If \( \cot \theta = \frac{5}{12} \), find \( \sec \theta \).
   a. \( \sec \theta = \frac{8}{5} \)
   b. \( \sec \theta = \frac{13}{5} \)
   c. \( \sec \theta = \frac{6}{7} \)
   d. \( \sec \theta = \frac{6}{7} \)

45. Write 62° 21′ 47″ as a decimal to the nearest thousandth.
   a. 62.413°
   b. 62.366°
   c. 62.363°
   d. 62.373°

46. Change 3.94 radians to degree measure. Round to the nearest tenth.
   a. 405.7°
   b. 315.7°
   c. 225.7°
   d. 585.7°

47. For a circle of radius 2 feet, find the arc length \( s \) subtended by a central angle of 54°.
   a. \( s = \frac{3}{10} \pi \) feet
   b. \( s = \frac{3}{5} \pi \) feet
   c. \( s = \frac{12}{5} \pi \) feet
   d. \( s = \frac{6}{5} \pi \) feet

48. Jack’s bicycle tires have a diameter of 22 inches. If he rides at 6 miles per hour, what is the angular velocity of the wheels in revolutions per minute (rpm)?
   a. 4.17 rpm
   b. 15.28 rpm
   c. 288 rpm
   d. 91.67 rpm
Identify the answer choice that best answers the question.

____49. Find the least positive angle measurement that is coterminal with \(-230^\circ\).
   a. \(135^\circ\)
   b. \(132^\circ\)
   c. \(140^\circ\)
   d. \(130^\circ\)

____50. Suppose \(\theta\) is an angle in the standard position whose terminal side is in Quadrant III and \(\sec \theta = -\frac{17}{8}\).
   Find the exact values of \(\cot \theta\).
   a. \(-\frac{15}{8}\)
   b. \(\frac{9}{15}\)
   c. \(\frac{9}{8}\)
   d. \(\frac{9}{15}\)

____51. Find the exact value of \(\cos 780^\circ\).
   a. \(\frac{1}{\sqrt{2}}\)
   b. \(\sqrt{3}\)
   c. \(\frac{1}{2}\)
   d. \(\frac{\sqrt{3}}{2}\)

____52. Find the exact value of \(\sin \frac{9\pi}{4}\).
   a. 1
   b. \(\frac{\sqrt{2}}{2}\)
   c. \(\frac{\sqrt{2}}{2}\)
   d. 0

____53. Find the reference angle for \(288^\circ\).
   a. \(89^\circ\)
   b. \(59^\circ\)
   c. \(72^\circ\)
   d. \(108^\circ\)

____54. Find the exact value of \(\sin \frac{5\pi}{4}\).
   a. \(\frac{\sqrt{2}}{2}\)
   b. \(-\frac{\sqrt{2}}{2}\)
   c. \(-\frac{\sqrt{2}}{2}\)
   d. undefined

____55. Use the unit circle to find the value of \(\sin(-180^\circ)\).
   a. 1
   b. -1
   c. 0
   d. undefined

____56. Evaluate \(\csc(-1740^\circ)\).
   a. \(\frac{1}{2}\)
   b. 2
   c. \(\frac{2}{\sqrt{3}}\)
   d. \(\frac{1}{\sqrt{2}}\)

____57. Write an equation of the sine function with the given amplitude, period, phase shift, and vertical shift.
   Amplitude = 4, period = \(\pi\), phase shift = \(-\frac{1}{6}\pi\), vertical shift = -1.
   a. \(y = 4 \sin \left(\frac{1}{2} \theta + \frac{1}{3}\pi\right) + 1\)
   b. \(y = 4 \sin \left(2 \theta - \frac{1}{3}\pi\right) + 1\)
   c. \(y = 4 \sin \left(2 \theta + \frac{1}{3}\pi\right) - 1\)
   d. \(y = 4 \sin \left(\frac{1}{2} \theta - \frac{1}{3}\pi\right) - 1\)

____58. The normal monthly temperatures (°F) for Omaha, Nebraska, are recorded below.

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp.</td>
<td>21</td>
<td>27</td>
<td>39</td>
<td>52</td>
<td>62</td>
<td>72</td>
<td>77</td>
<td>74</td>
<td>65</td>
<td>53</td>
<td>39</td>
<td>25</td>
</tr>
</tbody>
</table>

i) Write a sinusoidal function that models Omaha’s monthly temperature variation.
   ii) Use the model to estimate the normal temperature during the month of April.
   a. \(y = 28 \cos \left(\frac{\pi}{6}t - \frac{7\pi}{6}\right) + 49; 49^\circ\)
   b. \(y = 49 \cos \left(\frac{\pi}{6}t - \frac{7\pi}{6}\right) + 28; 56^\circ\)
   c. \(y = 28 \sin \left(\frac{\pi}{6}t - \frac{7\pi}{6}\right) + 49; 49^\circ\)
   d. \(y = 28 \cos \left(\frac{\pi}{12}t + \frac{7\pi}{12}\right) + 49; 49^\circ\)

____59. Given a triangle with \(a = 14\), \(A = 41^\circ\), \(B = 34^\circ\), what is the length of \(c\)? Round to the nearest tenth.
   a. 21.6
   b. 20.6
   c. 19.6
   d. 22.6

____60. Solve \(\triangle ABC\) when \(c = 9\), \(B = 40^\circ\), \(C = 60^\circ\).
   a. \(A = 80^\circ, a = 9, b = 6.7\)
   b. \(A = 80^\circ, a = 6.7, b = 10.2\)
   c. \(A = 80^\circ, a = 10.2, b = 6.7\)
   d. \(A = 80^\circ, a = 70.4, b = 6.7\)
__61. Determine whether $\triangle ABC$ should be solved by using the Law of Sines or the Law of Cosines. Then solve the triangle. $a = 19, b = 20, c = 63^\circ$
  a. Law of Sines; $c = 33, A = 31^\circ, B = 86^\circ$
  b. Law of Cosines; $c = 33, A = 31^\circ, B = 86^\circ$
  c. Law of Cosines; $c = 20.4, A = 61^\circ, B = 61^\circ$
  d. Law of Cosines; $c = 20.4, A = 56^\circ, B = 61^\circ$

__62. Find $\sum_{k=5}^{10} (5k + 3)$.
  a. 28  
  b. 53  
  c. 45  
  d. 243

__63. Write an arithmetic sequence that has three arithmetic means between 155 and 215.
  a. 155, 170, 185, 200, 215  
  b. 155, 200, 185, 170, 215  
  c. 155, 165, 175, 185, 215  
  d. 155, 175, 195, 205, 215

__64. Find $S_n$ if $a_1 = 22, d = -11$, and $n = 20$.
  a. -1870  
  b. -3300  
  c. 2310  
  d. -1650

__65. Find the sum of the given arithmetic series.
  $\sum_{x=10}^{40} (18x + 9)$
  a. 1,446,309  
  b. 1,372,410  
  c. 1,439,100  
  d. 1,440,855

__66. Find the sum of the first 50 terms of the sequence 8, 10, 12, 14, 16, ...
  a. 2850  
  b. 2852  
  c. 2851  
  d. 2849

__67. Find the geometric means in the following sequence. $-9, \ldots, \ldots, \ldots, \ldots, -9216$
  a. $-144, -576, -2,304, -9,231$
  b. $36, 144, 576, 2,304$
  c. $-720, -1,080, -1,440, -1,800$
  d. $36, -144, -576, -2,304$

__68. Find $a_1$ if $S_n = 48,785, r = 3.4$, and $n = 3$.
  a. 2,385.58  
  b. 5,325.87  
  c. 3,056.70  
  d. 16,258.27

__69. Find the next term of the geometric sequence: 7, -35, 175, -875
  a. -700  
  b. 4,275  
  c. 4,498  
  d. 4,375

__70. Find the nth term of the geometric sequence if $a_2 = 2, r = -3$, and $n = 9$.
  a. 13,122  
  b. -4,374  
  c. 1,458  
  d. -2,187

__71. Frank has a sheet of paper which is $\frac{1}{624}$-inch thick. If the sheet is folded in half, the total thickness will be $\frac{1}{312}$-inch. A second fold will produce a total thickness of $\frac{1}{156}$-inch. What will be the thickness of the sheet if Frank folds it 8 times?
  a. 0.41 in.  
  b. 14.001 in.  
  c. 0.205 in.  
  d. 128 in.

__72. Form a sequence that has two geometric means between -6 and -162.
  a. -6, 54, -54, -162  
  b. -6, $\sqrt{-18}$, -54  
  c. -6, -18, -54, -162  
  d. -18, 54, $\sqrt{-6}$

__73. Find the sum of the first 8 terms of the series: $8 - 16 + 32 - 64 + \ldots$
  a. -681  
  b. -680  
  c. -682  
  d. -679

__74. Find the sum of the first five terms of a geometric series with $a_1 = 0.28$, $a_5 = 362.88$, and $r = 6$
  a. 435.4  
  b. 51.4  
  c. 311.08  
  d. 874.94

__75. Find the sum of an infinite geometric series in which $a_1 = -10$ and $r = -0.03$.
  a. -9.71  
  b. -9.7  
  c. -10.31  
  d. -43.63