1. Solve the equation.

\[ 2(x + 3) + 5 = 4(2x - 5) + 7 \]

The answer is:

(A) Less than \(-5\)
(B) Between \(-5\) and \(-1\)
(C) Between \(-1\) and \(3\)
(D) Between \(3\) and \(7\)
(E) More than \(7\)

2. Solve for \(x\):

\[ \frac{1}{3}x + 4 = \frac{1}{5}x + 8 \]

The solution is a number:

(A) less than \(5\)
(B) between \(5\) and \(15\)
(C) between \(15\) and \(25\)
(D) between \(25\) and \(35\)
(E) greater than \(35\)

3. Solve the equation.

\[ 0.2(p - 1) - 0.5(3p + 2) = 0.7p \]

The answer is:

(A) \(p = 0.4\)
(B) \(p = 0.5\)
(C) \(p = -0.6\)
(D) \(p = -1.5\)
(E) None of these

4. Solve the equation.

\[ \frac{4}{x - 2} + 3 = \frac{x + 2}{x - 2} \]

The answer is:

(A) \(x = 5\)
(B) \(x = 2\)
(C) \(x = 0\)
(D) \(x = \frac{8}{3}\)
(E) There is no solution
5. Determine the values of $x$ and $y$ that solve the system of equations below.

\[
\begin{align*}
2x + y &= 5 \\
x - 3y &= 13
\end{align*}
\]

What is the value of $x$?

(A) $x = \frac{-28}{5}$  
(B) $x = \frac{13}{7}$  
(C) $x = 4$  
(D) $x = \frac{43}{14}$  
(E) $x = -\frac{2}{7}$

6. Solve for $x$: \[\frac{1}{x-2} + \frac{1}{3x} = \frac{2}{x}\]

(A) $x = 5$  
(B) $x = 4$  
(C) $x = \frac{5}{2}$  
(D) $x = -1$  
(E) There is no real solution

7. Which one of the following would be the correct mathematical expression for the following statement:

“The sum of a number and 5 less than twice the number is four times the number.”

(A) $x + 2(x - 5) = 4x$  
(B) $x + 2x - 5 = 4x$  
(C) $x + 2(x - 5) = 4 \cdot 2(x - 5)$  
(D) $x + 2x - 5 = 4 \cdot (2x - 5)$  
(E) $x + 2x - 5 = x + 4$

8. A new car salesperson is paid a monthly salary of $500 plus a commission of 5% of all the sales she makes each month. What monthly sales figure would give her of a monthly income of $1,200?

(A) $35$  
(B) $1,400$  
(C) $3,500$  
(D) $14,000$  
(E) $34,000$
9. The rental fee for a compact car is $18 per day (Monday through Thursday) and $24 per day (Friday through Sunday). This rental fee includes 100 free miles per day. Additional miles cost $0.15 per mile. Write an equation for the total cost of a rental, \( c(x) \), from Wednesday through Saturday (4 complete days) where \( x \) represents the number of miles traveled and \( x \) is greater than 400. (You may ignore the tax).

(A) \( c(x) = 84 + 0.15(x - 400) \)  
(B) \( c(x) = 84x + 0.15(x - 400) \)  
(C) \( c(x) = 84 + 0.15(400 - x) \)  
(D) \( c(x) = 84x + 0.15(400 - x) \)

10. A couple invests $3500 to build a rose garden. On the average, it costs them $0.35 to grow each rose. If each rose can be sold for $1.75, how many roses must they sell to break even?

(A) 2,000  
(B) 2,500  
(C) 10,000  
(D) 8,250  
(E) None of these

11. You invest a total of $1000 in two accounts. The first pays 6% annual interest, the other pays 9% annual interest. At the end of one year you collect $84.60 in interest. How much was invested in the first account?

(A) between $150 and $200  
(B) between $200 and $250  
(C) between $250 and $300  
(D) between $300 and $350  
(E) between $350 and $400

12. A shop owner wants to mix high quality coffee beans that cost $5.00 per pound with cheaper beans that cost $1.00 per pound to get a 20-pound blend that should be worth $3.50 per pound. How much of the cheap coffee should be used?

(A) 15.875 pounds  
(B) 12.5 pounds  
(C) 7.5 pounds  
(D) 4.125 pounds

13. A chemist needs 130 ml of a 31% acid solution, but has only 7% and 46% solutions available. How many ml of the 46% solution should be added to get the desired solution?

(A) 50 ml  
(B) 60 ml  
(C) 70 ml  
(D) 80 ml  
(E) 90 ml
14. An airplane flies 490 miles with the wind and 350 miles against the wind in the same length of time. If the speed of the wind is a fixed 40 mph, what is the speed of the airplane in still air?

(A) 220 mph  
(B) 240 mph  
(C) 245 mph  
(D) 250 mph  
(E) 290 mph

15. George and Matt have a painting business. George has less experience and it takes him 3 hours more to paint a medium-sized room than it takes Matt. Working together they can paint a medium-sized room in 5 hours. How long does it take George to paint a medium-sized room by himself? Round your answer to the nearest tenth of an hour if necessary.

(A) 11 hours  
(B) 11.7 hours  
(C) 12.4 hours  
(D) 13.1 hours  
(E) 13.8 hours

16. The typical costs for two different kinds of heating systems for a 3 bedroom housing unit are given in the table below:

<table>
<thead>
<tr>
<th>Type of System</th>
<th>Installation Cost</th>
<th>Operation Cost/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>$5,000</td>
<td>$1,100</td>
</tr>
<tr>
<td>Solar</td>
<td>$30,000</td>
<td>$150</td>
</tr>
</tbody>
</table>

After how many years of operation will the total costs of solar heating and electric heating be the same?

(A) less than 15 years  
(B) between 15 and 20 years  
(C) between 20 and 25 years  
(D) between 25 and 30 years  
(E) more than 30 years
17. Solve for $x$. \[ 4x^2 + 8x = 5 \]

The largest real solution is:

(A) $x = 5$

(B) $x = 3$

(C) $x = \frac{1}{2}$

(D) $x = -\frac{5}{2}$

(E) $x = -5$

18. Solve for $x$. \[ x^2 - 9 = 3x \]

The smallest real solution is:

(A) $x = -\frac{9}{5}$

(B) $x = \frac{49}{10}$

(C) $x = \frac{3 - 3\sqrt{5}}{2}$

(D) $x = \frac{-3 - 3\sqrt{5}}{2}$

(E) There is no real solution

19. Solve for $x$. \[ (x + 3)(x - 5) = -7 \]

The solution(s) is/are:

(A) $x = -3, 5$ only

(B) $x = -10, -2$ only

(C) $x = -4, -12$ only

(D) $x = 8, 10$ only

(E) $x = -2, 4$ only
20. An item is originally priced at $P$ dollars, but is placed on sale at a discount of 25% off. If the sales tax is 10%, what is an expression for the final sales price?

(A) $1.1 \cdot (0.25P)$  
(B) $\frac{1.1P}{0.75}$  
(C) $\frac{0.75P}{1.1}$  
(D) $\frac{1.1P}{0.25}$  
(E) $1.1 \cdot (0.75P)$

21. The sum of three consecutive odd integers is 261. Determine the largest of the three integers.

The largest of the three integers is:

(A) 89  
(B) 88  
(C) 87  
(D) 86  
(E) 85

22. The height of a leaf above the ground after it falls from a tree is given by the formula $s(t) = -3.8t^2 + 47.3$, where time is given in seconds and height is given in feet above the ground. When would the leaf land on the top a person’s head if the person was seated on the ground under the tree and their head was 2.7 feet above the ground?

The amount of time is:

(A) Between 3.5 and 3.6 seconds  
(B) Between 3.4 and 3.5 seconds  
(C) Between 3.3 and 3.4 seconds  
(D) Between 3.2 and 3.3 seconds  
(E) Between 3.1 and 3.2 seconds

23. As part of a physics experiment, Ming drops a baseball from the top of a 350-foot tall building. The distance $h$, in feet, that the ball travels is given by $h = 16t^2$, where $t$ is measured in seconds. For how many seconds will the baseball fall? Round your answer to the nearest tenth of a second.

(A) 1.2 sec  
(B) 4.7 sec  
(C) 6.3 sec  
(D) 12.4 sec  
(E) 21.9 sec
24. Determine the dimensions (i.e. the length and width) of a rectangle whose diagonal is 25 meters and whose perimeter is 62 meters. One of the dimensions is:

(A) 8 meters  
(B) 16 meters  
(C) 21 meters  
(D) 24 meters  
(E) 31 meters

25. The height of a right triangle is 5 cm more than its base. The area of the triangle is 42 sq cm. Find the length of the hypotenuse.

(A) $\sqrt{193}$ cm  
(B) 19 cm  
(C) $\sqrt{95}$ cm  
(D) $\sqrt{172}$ cm  
(E) 23 cm

26. The manager of a candy shop sells chocolate covered peanuts for $7 per pound, and chocolate covered cashews for $13 per pound. The manager wishes to mix 100 pounds of the cashews to get a cashew-peanut mixture that will sell for $12 per pound. How many pounds of peanuts should be used?

(A) 80 pounds  
(B) 50 pounds  
(C) 30 pounds  
(D) 20 pounds  
(E) 10 pounds

27. An experienced bank auditor can check a bank’s deposits in half the amount of time that it takes a new auditor. Working together, it takes the auditors 4 hours to do the job. How long would it take the new auditor working alone?

(A) 6 hours  
(B) 7 hours  
(C) 8 hours  
(D) 10 hours  
(E) 12 hours
28. A train that is traveling 52 mph leaves a train station and goes west. Another train leaves the same train station one hour later on a parallel track traveling west at 65 mph. How long will it take the fast train to catch up with the slow train?

(A) 6 hours    (B) 5 hours    (C) 4 hours    (D) 1.25 hours    (E) None of these

29. Janet is training for a triathlon. Yesterday she jogged for 10 miles and then cycled another 45.5 miles. Her speed while cycling was 6 miles per hour faster than her jogging speed. If the total time for jogging and cycling was 4.5 hours, at what rate did she cycle? Round your answer to the nearest one mph.

(A) 12 mph    (B) 14 mph    (C) 16 mph    (D) 17 mph    (E) 18 mph

30. Write the equation of the line (in the form $Ax + By = C$) that passes through the point $(-2, 2)$ and has a slope of $-\frac{1}{2}$.

(A) $x + 2y = 2$    (B) $2x + y = -2$    (C) $x - 2y = -6$

(D) $x + 2y = 3$    (E) $2x + y = 2$

31. Write the equation of the line passing through the points $(2, 3)$ and $(5, -15)$.

(A) $y = -4x + 11$    (B) $y = -6x + 9$    (C) $y = -4x + 5$

(D) $y = 6x - 9$    (E) $y = -6x + 15$

32. Write the equation of the line through the point $(2, 3)$ and having undefined slope.

(A) $x = 2$    (B) $y = 2$    (C) $x = 3$    (D) $y = 3$    (E) $x = 0$

33. Write the equation of the line through the point $(5, -1)$ and having a slope of 0.

(A) $x = 5$    (B) $y = 5$    (C) $x = -1$    (D) $x = 0$    (E) $y = -1$
34. Determine the equation of the line perpendicular to $2x - y = 3$ that passes through the point $(1, 3)$. The sum of the slope and the $y$-intercept is:

(A) $-2$   (B) $\frac{1}{2}$   (C) $1$   (D) $\frac{5}{2}$   (E) $3$

35. Determine an equation of the line containing the point $(-2, 3)$ and perpendicular to the line containing the points $(1, -1)$ and $(4, 1)$.

(A) $y = -\frac{3}{2}x$

(B) $y = -\frac{3}{2}x + 3$

(C) $y = \frac{2}{3}x + \frac{5}{3}$

(D) $y = \frac{3}{2}x + 6$

(E) $y = \frac{2}{3}x + \frac{13}{3}$

36. Given the line $x = 2$, determine the equation of the line parallel to this line that passes through the point $(5, 7)$.

(A) $y = 2x + 7$   (B) $y = -\frac{5}{7}x + \frac{2}{7}$   (C) $y = 7$

(D) $x = 5$   (E) $y = -2x + 5$

37. Given the line $x = 2$, determine the equation of the line perpendicular to this line that passes through the point $(2, 3)$.

(A) $y = -2x + 2$   (B) $y = -\frac{1}{2}x + 4$   (C) $y = 3$

(D) $x = 2$   (E) $y = -\frac{1}{2}x$
38. Determine an equation for the line passing through the point \((-7, 4)\) and perpendicular to the line \(2x - 9 = 0\).

(A) \(x = -7\)  
(B) \(y = -7\)  
(C) \(y = \frac{1}{2}x + \frac{1}{2}\)

(D) \(y = 4\)  
(E) \(y = 2x + 18\)

39. Determine an equation for the line passing through the point \((-7, 4)\) and parallel to the line \(2x - 9 = 0\).

(A) \(x = -7\)  
(B) \(y = -7\)  
(C) \(y = \frac{1}{2}x + \frac{1}{2}\)

(D) \(x = 4\)  
(E) \(y = 2x + 18\)

40. Which of these lines has a slope of zero?

(A) \(x = 0\)  
(B) \(y + 3 = 5x + 20\)  
(C) \(y - 5 = 0\)

(D) \(Ax + By = C\), where \(A\) is positive, \(B\) is negative, and \(C\) is a real number
### Spring 2016 Midterm 1 Study Guide Answers

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<th>Question</th>
<th>Answer</th>
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