Final Exam Review Pack – Section 2

Relations

- Relations are sets of ordered pairs \((x, y)\)
- The set of the first components, or \(x -\) values, is the **domain**
- The set of the second components or \(y -\) values, is called the **range**
- This makes \(x\) the **independent variable**
- Choosing input values for \(x\) provides us with output values for \(y\)
- This makes \(y\) the **dependant variable**

Vertical Line Test for Functions

- An equation defines \(y\) as a function of \(x\) if and only if every vertical line in the coordinate plane intersects the graph of the equation only once.

Horizontal Line Test for One-to-One Functions

- A function \(y\) is a one-to-one function of \(x\) if and only if every horizontal line in the coordinate plane intersects the function at most only once.

Graphing linear Equations of the Type \(Ax + By = C\)

1. To find the \(y -\) intercept (where the line crosses the \(y - axis\)), set \(x = 0\) and solve for \(y\).
2. To find the \(x -\) intercept (where the line crosses the \(x\)-axis), set \(y = 0\) and solve for \(x\).
3. To get a third point, pick another value for \(x\), and solve for \(y\).
4. Plot the three points from steps 1 and 2 and draw a straight line through the points.

Graphing Linear Equations of the Type \(y = mx + b\)

1. Identify the \(y -\) intercept, plot that point.
2. Identify the Slope in the given equation and trace it to your next point, plot that
3. Repeat step #2
4. Connect the points to create your line.

\[
\text{Slope} = \frac{\text{Rise}}{\text{Run}} \quad b = y - \text{intercept}
\]
Domain and Range Refresher

**Domain:** The Domain of the graph is the representation of every possible $x - value$ (input) that the graph contains.

**Range:** The Range of the graph is the representation of every possible $y - value$ (output) that the graph contains.

Slope

- The slope of a linear equation describes the steepness and direction of a line.
- As a line is traced from left to right the slope is the vertical change relative to the horizontal change.
- There are 4 types of slope:
  - Negative
  - Zero
  - Positive
  - Undefined

Finding slope from a graph

**Slope ($m$)**

$$m = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

Non-Linear Equations

Rules for graphing Non-Linear Equations

1. Use positive numbers, negative numbers, and zero whenever possible.
2. If any value is to an even power both positive and negative values must be used.

Use values between 0 and 1 when the variable is in the denominator, or is in the exponent.
Without plotting on a grid, which quadrant do the following points belong to?

1. $(−4, −2)$
2. $(6, −3)$
3. $(1, 3)$
4. $(−2, 6)$
5. $(3, 0)$
6. $(0, 0)$

7. **Plot the points of the grid provided**

<table>
<thead>
<tr>
<th>$A(3, 1)$</th>
<th>$B(−4, 2)$</th>
<th>$C(5, 0)$</th>
<th>$D(0, −2)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E(−3, −5)$</td>
<td>$F(4, −3)$</td>
<td>$G(4, 0)$</td>
<td>$H(10, −4)$</td>
</tr>
</tbody>
</table>

8. Use the vertical line test to determine if the following are relations or functions

   10. 

   11. 

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Do the mapping notations into functions, 1-1 functions, or neither?

12. [Diagram of mapping notation with domain 3 and range 2]

13. [Diagram of mapping notation with domain 5 and range -3]

14. [Diagram of mapping notation with domain 2 and range 3]

15. [Diagram of mapping notation with domain 2 and range -3]

Determine whether the given ordered pair is a solution to the equation (a point on the line).

16. (2, 3); \(-3x + 5y = -9\)

17. (0, 4); \(y = -\frac{1}{3}x - 4\)

18. (1, -1); \(3y = -5 + 2x\)

19. (6, 8); \(-\frac{1}{3}x - \frac{1}{4}y = 4\)

Graph the following Linear Equations

20. \(-2x + 3y = 6\)

21. \(2x - y = -4\)
22. \(2x + \frac{1}{2}y = 2\)

23. \(3x + 2y = -12\)

24. \(x = -3\)

25. \(y = -3\)
Graph the following Non-Linear Equations

26. \( y = -x^2 + 5 \)

27. \( x = 2y^2 \)

28. \( y = 2^x \)

29. \( y = \frac{1}{x} \)
30. \( y = x^2 - 2 \)

31. \( y = x^3 \)

32. \( y = (x - 3)^2 \)

33. \( y = (x - 2)^2 + 2 \)
34. **Match the column on the left with the column on the right**

   a) run  
   i) \( x = 3 \)

   b) slope  
   ii) difference in \( x \)

   c) rise  
   iii) \( \frac{\text{difference in} \ y}{\text{difference in} \ x} \)

   d) vertical line  
   iv) difference in \( y \)

   e) horizontal line  
   v) \( y = -1 \)

**Determine if the slope is positive, negative, zero, or undefined.**

35. **36.**

37. ![Graph](image1)

38. ![Graph](image2)

**Find the slope from the points provided**

39. \((-2, 3)\) and \((6, -9)\)  
40. \((3, -2)\) and \((-7, 10)\)

41. \((-1, 7)\) and \((4, 4)\)  
42. \((2, -2)\) and \((2, -2)\)

43. \((-5, -1)\) and \((-5, 1)\)  
44. \((3, 1)\) and \((-6, -8)\)
45. A long distance runner passes the 34km mark of a race in 1hr 20 min, and passes the 52km mark 1 hour later. Assuming a constant rate, find the speed of the long distance runner in km/hr.

46. A plane at an altitude of 30 000 feet starts to descend for landing after flying for six hours. The entire flight time was 6 hours and 40 minutes. Determine the average rate of descent, in feet per minute, of the plane.

47. As a window washer begins work on a high rise, one-eighth of the windows were already clean. Four hours later, five-sixths of all the windows are clean. Calculate the window washer’s cleaning rate.

48. A 6 foot long treadmill rises eight inches to make an incline for running. What is the slope of the treadmill?
Graph the line that passes through the given point and has the given slope

49. \((0, -7); m = 1\)

50. \((-3, 4); m = 2\)

51. \((1, 5); m = -\frac{3}{4}\)

52. \((-3, 1); m = \frac{3}{2}\)

53. \((6, 5); m = -\frac{3}{5}\)

54. \((7, -5); m = -\frac{2}{3}\)
Graph the line with the given slope and intercept

55. $x$-intercept: $(5, 0); m = -1$

56. $y$-intercept: $(0, 8); m = -2$

57. $x$-intercept: $(6, 0); m = \frac{-3}{4}$

58. $y$-intercept: $(0, 4); m = \frac{3}{2}$

Determine the slope of the line with the given $x$ and $y$ intercepts

59. $(2, 0), (0, 2)$

60. $(-2, 0), (0, -2)$

61. $(2, 0), (0, -2)$
Determine whether the line passing through the first pair of points is parallel, perpendicular, or neither to the line passing through the second pair of points

62. \((3, 2)\) and \((1, 4)\); \((1, -2)\) and \((3, -4)\)

63. \((5, -6)\) and \((7, -8)\); \((-5, -6)\) and \((-7, -8)\)

64. \((0, 4)\) and \((-1, 2)\); \((-3, 5)\) and \((1, 7)\)

65. \((2, 3)\) and \((3, 0)\); \((-2, -5)\) and \((1, -6)\)

66. A taxi driver charges a passenger $31.10 to travel 20 km, and charged another passenger $47.74 to travel 33 km.
   a) Find the cost per km
   
   b) Write the equation that shows how the total cost, \(T\), depends on the number of kilometers, \(K\), plus a fixed amount
   
   c) How far can a person travel for $58.90
   
   d) Determine the Domain and Range