MTHS 100

DOUBLE TUTORIAL 7

First Hour

Question 1. Which of the following functions are linear? If a function is linear, what is its slope and its y-intercept?

(a) $y = -95x + 7$,

(b) $y = 2x - 1 + x^2$,

(c) $y = x$,

(d) $y = -8$,

(e) $y = \frac{3}{x}$,

(f) $y = \frac{5}{2}x + 9$,

(g) $y + 5 - x = -\frac{1}{2}x$.

Question 2. Given the linear function $f(x) = \frac{1}{3}x - 1$ on the domain $[-3, 3]$ and the codomain $[-2, 2]$.

(a) Is the function $f(x)$ increasing or decreasing?

(b) Find the values of the function at the end points of the domain.

(c) Sketch the graph of the function, show its domain and codomain.

(d) Find the range of $f(x)$. Does it coincide with the codomain?

(e) Is the function invertible? Why? Restrict the codomain to make the function invertible.

(f) Write out the formula for the inverse.

(g) Sketch the graph of the inverse in the same coordinate system.

Question 3. Find the x- and y-intercepts for the following functions

(a) $y = 4x + 6$,

(b) $y = 2$,

(c) $y = \sqrt{2}x - 3$.

Question 4. A straight line passes through the points (0,1) and (4,6). Find the equation of the straight line.

Question 5. A cab company charges \$4.20 when taxi meter is started, plus an additional \$1.622 per mile driven. How long is a cab ride that costs \$50? Write and solve an equation to find the answer.

Question 6*. A cab company charges \$4.20 when taxi meter is started, plus an additional \$1.622 per kilometre driven, and $56.8\,c$ per minute if travelling below $21\,km/h$. One day Andy payed \$50 for a cab ride from airport to his home when the cab stayed 5 minutes in a traffic jam. How long was he stuck in a traffic jam at another day if he has paid \$53.70? What is the distance from his home to the airport? Write and solve a system of linear equations.

Second Hour

Question 1. Which of the following functions are quadratic?

(a) $y = 5x^2 - 1$,

(b) $y = 4x + 3$,

(c) $y = \frac{4-x}{x^2}$,

(d) $y = \frac{-7x^2+9x-17}{3}$,

(e) $y = \frac{3}{4} - \frac{1}{2}x^2 + \frac{7}{5}x$.

Question 2.

(a) Calculate the values of the function $y = \frac{1}{2}x^2$ at points $x = -3, -2, -1, 0, 1, 2, 3$. Mark these points in the Cartesian coordinate system.

(b) Sketch the graph of the function $y = \frac{1}{2}x^2$ on the domain $[-3, 3]$. What are the coordinates of the vertex? Is this function concave up or concave down?

(c) Use the translation and sketch the graph of the function $y = \frac{1}{2}x^2 - 2$ in the same coordinate system. What are the coordinates of the vertex?

(d) Use the translation and sketch the graph of the function $y = \frac{1}{2}(x-3)^2 - 2$ on the domain $[0, 3]$. What are the coordinates of the vertex?

Question 3. Convert the quadratic functions given in a vertex form into the general form. What are the coordinates of the vertex for each parabola?

(a) $y = (x-5)^2 - 25$,

(b) $y = \frac{2}{5}(x+5)^2 - 1$,

(c) $y = -(x-3)^2 + 1$.

Question 4. Find the coordinates of the vertices of the following parabolas. Are these parabolas concave up or concave down?

(a) $y = x^2 - 5x + 3$,

(b) $y = -3x^2 + 3$,

(c) $y = \frac{3}{7}x^2 - 3x + 2$.

Question 5. Is the function $y = 4x^2$, defined on the domain $\mathbb{R}$ with the codomain $[0, \infty)$, invertible? Will it be invertible if we restrict the domain to the interval $[0, \infty)$? If not, explain why. If yes, write the formula for the inverse.

Question 6. Consider the function $y = -x^2 + 6x - 8$ on the interval $[-4, 4]$.

(a) Is the graph of this function a concave up or a concave down parabola?

(b) Find the x- and y-intercepts of the parabola.

(c) Find the coordinates of the vertex of this parabola.

(d) Sketch the parabola.

(e) What is the local minimum/maximum of this function?

(f) What is the global minimum/maximum of the function?