Lab 1 & 2
CALCULUS FOR IT - 501031

1 Exercises

Exercise 1: Write a computer program to compute the functions in their domain

(a) $f(x) = \sqrt{x}$
(b) $f(x) = \sqrt[3]{x}$
(c) $f(x) = x^{\frac{2}{3}}$
(d) $f(x) = \frac{x^3}{3} - \frac{x^2}{2} - 2x + \frac{1}{3}$
(e) $f(x) = \frac{2x^2 - 3}{7x + 4}$
(f) $f(x) = \frac{5x^2 + 8x - 3}{3x^2 + 2}$
(g) $f(x) = sin(x)$
(h) $f(x) = cos(x)$
(i) $f(x) = 3^x$
(j) $f(x) = 10^{-x}$
(k) $f(x) = e^x$
(l) $f(x) = log_2(x)$
(m) $f(x) = log_{10}(x)$
(n) $f(x) = ln(x)$

Note: It notes that the function name is defined by the type of function. For example, $f(x) = \sqrt{x}$ has the function name that will be defined as *Exponentialfunction_ a(x)*

Exercise 2: Write a computer program to find the range of the functions below

(a) $f(x) = 2 + \frac{x^2}{x^2 + 4}$ with $x \in [-2, 2]$
(b) $f(x) = \sqrt{5x + 10}$ with $x \in [0, 5]$
(c) $f(x) = \frac{2}{x^2 - 16}$ with $x \in [5, 10]$
(d) $f(x) = x^4 + 3x^2 - 1$ with $x \in [-3, 3]$
(e) $f(x) = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$, with $x = 3, x = -3$
(f) $f(x) = \begin{cases} -x, & x < 0 \\ x^2, & 0 \leq x \leq 1 \\ 1, & x > 1 \end{cases}$, with $x = 3, x = -3,$ and $x = \frac{1}{2}$

Exercise 3: Write a computer program to identify the arbitrary function that is categorized as

(a) Even function.
(b) Odd function.
(c) Increasing function.
(d) Decreasing function.

And then, perform to evaluate the below functions that is even, odd, or neither.

(a) $f(x) = x^{-5}$
(b) $f(x) = x^2 + x$
(c) $f(x) = x^2 + 1$
(d) $f(x) = x^3 + x$
(e) $f(x) = \mid x^3 \mid$
(f) $f(x) = 2x + 1$
(g) $f(x) = x^4 + 3x^2 - 1$
(h) $f(x) = 2 \mid x \mid +1$

Finally, specify the intervals over which the function is increasing and the intervals where it is decreasing.

(i) $f(x) = -x^3$
(j) $f(x) = -\dfrac{1}{x^2}$
(k) $f(x) = -\dfrac{1}{x}$
(l) $f(x) = \dfrac{1}{\mid x \mid}$
(m) $f(x) = \sqrt{\mid x \mid}$
(n) $f(x) = \sqrt{\mid -x \mid}$

Exercise 4: Write a computer program to find the root of $f(x) = x^2 + 2x - 1$.

Exercise 5: Write a computer program to show the following functions in the graph.

(a) $f(x) = \sqrt{\mid x \mid}$
(b) $f(x) = x^4 + 3x^2 - 1$
(c) $f(x) = x^3 + x$
(d) $f(x) = e^x$
(e) $f(x) = ln(x)$
(f) $f(x) = \dfrac{2x^2 - 3}{7x + 4}$

Exercise 6: Write a computer program to compute the composites of function $f_1(x)$ and $f_2(x)$. Meanwhile, $f_1 = x + 5$ and $f_2(x) = x^2 - 3$.

(a) $f_1(f_2(0))$
(b) $f_2(f_1(0))$
(c) $f_1(f_1(-5))$
(d) $f_2(f_2(2))$

Exercise 7: Write a computer program to show the below functions in a graph.

$$x = 4sin(t)^5 + 5$$
$$y = 3cos(t) - 1.7cos(2t) - cos(3t) + 1$$

Find the appropriate t values for these functions.

Exercise 8: Write a computer program to plot the functions on a graph.

$$f_1(x) = -x + 5$$
$$f_2(x) = \frac{x}{2} + 2$$

Find the appropriate x values for these functions, and mark the intersection point of f_1 and f_2.

Exercise 9: Write a computer program to plot the functions: $f_1(x) = \sqrt{1 - (\mid x \mid -1)^2}$, $f_2(x) = -3\sqrt{1 - \sqrt{\dfrac{\mid x \mid}{2}}}$.

f_1 is drawn with magenta color, f_2 is drawn with red color, and $x \in [-2, 2]$.

Exercise 10: Write a computer program to show the original and shifted graphs together, labeling each graph with its equation in these following cases

(a) $f(x) = x^2 + k$, for $k = 2, 4, 6, 8, 10, 12$, and $x \in [-10, 10]$.

(b) $f(x + k) = (x + k)^2$, for $k = 2, 4, 6, 8, 10, 12$, and $x \in [-10, 10]$.

(c) $f(x) = k\sqrt{x}$, for $k = \frac{1}{3}, 1, 3, 6$, and $x \in [1, 50]$.

(d) $f(x) = x^3$, left 1, down 1.

(e) $f(x) = x^{2/3}$, right 1, down 1.

(f) $f(x) = \frac{1}{2}(x + 1) + 5$, down 5, right 1.

(g) $f(x) = \frac{1}{x^2}$, left 2, down 1.

(h) $f(x) = 1 - x^3$, stretched horizontally by a factor of 2.

(i) $f(x) = \sqrt{x + 1}$, compressed horizontally by a factor of 4.

(j) $f(x) = \sqrt{x + 1}$, stretched vertically by a factor of 3.

Exercise 11: Use a graph to decide whether f is one-to-one function

(a) $f(x) = x^3 - \frac{x}{2}$

(b) $f(x) = x^2 + \frac{x}{2}$