

(24 Points, Domain of each problem is worth 3 Points, and Range is worth 3 Points)

1) Find the **Domain** and **Range** of the following functions:

a) $f(x) = \sqrt{4 - 3x^2}$

b) $g(x) = \ln(\ln(x + 5))$

c) $g(x) = 1 + \frac{1}{\sin x}$

d) $g(x) = 1 + \frac{1}{x}$

(10 Points)

2) The graph of g is given.

a) State the value of $g(2)$

b) Is g one-to-one?

c) Estimate the value of $g^{-1}(3)$?

d) Estimate the domain of $g^{-1}(x)$

e) Sketch the graph of $g^{-1}(x)$

(10 Points) 3) Sketch the graph of the following function:

$$f(x) = \begin{cases} 2x+1 & \text{if } x < 2 \\ e^x & \text{if } x \geq 2 \end{cases}$$

(12 Points) 4) Determine whether f is even, odd, or neither even nor odd;
(Must Use Definition of Even, Odd Functions)

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

b) $f(x) = e^{-x^2}$

c) $f(x) = x + \sin(x)$

d) $f(x) = x^4 + 2x^2 + x$

(10 Points) 5) A small-appliance manufacturer finds that it costs \$9000 to produce 1000 toaster ovens a week and \$12000 to produce 1500 toaster ovens a week.

a) Express the cost as a function of the number of the toaster ovens produced, assuming that it is linear.

b) What is the slope of the graph and what does it represent?

c) What is the y-intercept of the graph and what does it represent?

(5 Points)

6) If $f(x) = 5x + \log(x + 10)$, find $f^{-1}(1)$

(10 Points)

7a) Sketch the curve represented by the parametric equation

$$x = \sqrt{t}, \quad y = 1 - t, \quad 0 \leq t \leq 5$$

Indicate with an arrow the direction in which the curve is traced as t increases.

Make a table of points with the corresponding values of t .

7b) Eliminate the parameter to find a Cartesian equation of the curve.

(Indicate the Domain and Range of the Cartesian equation)

(12 Points)

8) Use the following table to evaluate the expressions.

X	1	2	3	4	5	6
f(x)	6	5	4	1	3	5
g(x)	6	3	5	1	2	3

a) $f(g(2)) =$

b) $g(g(6)) =$

c) $(g \circ g \circ f)(5) =$

d) $(f \circ g \circ f)(6) =$

(12 Points) 9) Let f be a one-to-one function whose inverse function is given by the formula:

$$f^{-1}(x) = x^5 - 3x^3 + 5x + 2$$

- a) Compute $f^{-1}(-1)$
- b) Compute $f(1)$
- c) Compute the value of x such that $f(x) = 1$
- d) Compute the value of y such that $f^{-1}(y) = 1$

(12 Points) 10) Find a formula that describes the following function:

(12 Points) 11) If $f(x) = 2x^2 - 3x + 1$, find and simplify $\frac{f(x+h) - f(x)}{h}$, $h \neq 0$

(24 Points)

12) Given

$$f(x) = \ln(x) \text{ and } g(x) = x^2 - 9,$$

Find the following and State their Domains:

a) $f \circ g(x)$

b) $g \circ f(x)$

c) $f \circ f(x)$

d) $g \circ g(x)$

Extra Credits:

(6 points)

13) Find an expression for the function whose graph consists of the line segment from the point $(-2,2)$ to the point $(-1,0)$ together with the top half of the circle with the center at the origin and radius 1.

Extra Credits:

(4 points)

14) Express the function $F(x) = \frac{1}{\sqrt{x + \sqrt{x}}}$

as a composition of three functions (namely $(f \circ g \circ h)(x)$).

(Hint: Find $f(x)$, $g(x)$, and $h(x)$ so that $(f \circ g \circ h)(x) = \frac{1}{\sqrt{x + \sqrt{x}}}$)