The following questions relate to evaluations & working with & understanding function notation

(a) Evaluate the following:

f(2) ; = 1 f(-5) ; = 0 f(1) ; undefined g(12) ; = -7 f(4) ; = 4 f(-6) ; no value

$f(2) \times g(2)$; $1 \times -5.5 = -5.5$ $\frac{f(0)}{g(0)}$; $\frac{0}{-5.25} = 0$ $\frac{g(0)}{f(0)} = \frac{-5.25}{0}$ = undefined

(b) Evaluate

|f(7)| |-2| = 2 g(|-4|) ; g(4) = -5 |g(-4)| ; |-2.75| 2.75 is |g(-4)| = g(4)? ; 2.75 -5 NO is g(|-4|) = g(4) ? -5 -5 yes

(c) Evaluate fog(-1) ; f(-5.5) = -1 fof(-4) ; f(2) = 1 gof(11) ; g(-2) = 3.5 $g^{-1}(2)$; 10.25 -9.25 (y=2) $f^{-1}(-3)$ = .75, 1.25, 11.25 y = -3

(d) Solve the following:

f(x) = 7 ; x = -7 g(x) = -5 ; x = -1, 4 f(x) = -3 ; x = .75, x = 1.25, 11.25 f(x) = 5 ; no value g(x) = -1 x = -5.5, 8.25

(e) state the graphical and algebraic significance of f(0) as well as g(0)

x = 0 which represents the y-intercepts

(f) State the domain and range of g(x) and also for f(x)

g(x) D : x ∈ R Range {y ∈ R | y ≥ -5.75}

D : f(x) {x ∈ R | x ≠ -6, 1} R : f(x) {y ∈ R | y ≤ 4 OR 6 < y < 8}

(g) is f(-4.75) positive or negative? Explain how you determined this.

positive as Fcn IS ABOVE x axis at this point

(h) is g(-4.75) positive or negative? Explain how you determined this.

negative as g(x) is below x axis at this point

(i) state the graphical and algebraic significance of f(x) = 0 as well as g(x) = 0

these are the x-intercepts, zeroes or Roots where y = 0

(j) For what values of x is f(x) > 0? Explain how you determined this. $\{x \in R \mid x < -6$ OR $-5 < x < 0$ OR $1.75 < x < 5$ OR $7.75 < x < 10.5\}$

anywhere the graph is ABOVE the x axis

(k) Solve g(x) < 0.

$\{x \in R \mid -5 < x < 9\}$

(l) How often does the line y = -1 intersect y = f(x)? Intersect y = g(x) 6 times on f(x); twice on g(x)

(m) How often does the line x = -1 intersect y = f(x)? Intersect y = g(x) once on each

intersection

(n) Interpret the meaning of the state f(x) = g(x) then solve the equation f(x) = g(x). $x = -5.5$ or 1.2 or 9.8

where f and g have an identical function value for a given x value

(o) Interpret the meaning of the state f(x) < g(x) then solve the inequality f(x) > g(x).

where f is BELOW g

$\{x \in R \mid -5.5 < x < 1.6$ or $1.2 < x < 9.8\}$

asymptote

(p) Calculate the value of the difference quotient $\frac{f(7)-f(4)}{7-4}$ as well as $\frac{f(9)-f(7)}{9-7}$ and explain the sig. of the DQ.

$\frac{-2-4}{7-4} = \frac{-6}{3} = -2$

$\frac{2 - -2}{9-7} = \frac{4}{2} = 2$

average rate of change

(q) Determine the average rate of change of y = g(x) between x = 4 and x = 9

$$\frac{g(9)-g(4)}{9-4} = \frac{0 - -5}{9-4} = \frac{5}{5} = 1$$

Now let's work on other function concepts that relate to characteristics of functions, specifically y = f(x) now.

(a) On what interval is y = f(x) increasing, given the restricted domain of $\{x \in R \mid -6 < x \leq 7\}$?

$\{x \in R \mid -6 < x < -2.25 \text{ or } 1 < x < 4\}$

(b) On what interval is y = f(x) decreasing, given the restricted domain of $(-6,7]$?

$\{x \in R \mid -2.25 < x < 1 \text{ or } 4 < x < 7\}$

(c) Where are the local maximums & minimums of y = f(x), given the restricted domain of $\{x \in R \mid -6 < x \leq 7\}$?

at $x = -2.25$ $(-2.25, 3.75)$ max and $(4,4)$ max and $(7,-2)$ min

(d) Given the restricted domain of $\{x \in R \mid -10 < x \leq 4\}$, on what interval is y = f(x) concave up? Concave down?

Concave up $\{x \in R \mid -6 < x\}$ Concave Down $\{x \in R \mid -6 < x < 1 \text{ or } 1 < x < 4\}$

(e) Where are the roots of y = f(x)?

$x = -5, 0, 1.75, 6, 7.75, 10.5\}$

(f) Does y = f(x) appear to have any asymptotes? If so, where?

$x = 1$ and $y = 6$

(g) What does the concept of discontinuities mean, given that I have created y = f(x) to be a discontinuous function.

(h) What is a jump discontinuity? Where does f(x) have a "jump" discontinuity?

at $x = -6$ & $x = 4$

(i) What is an infinite discontinuity? Where does f(x) have an infinite discontinuity?

at $x = 1$

(g) What does the concept of discontinuities mean, given that I have created y = f(x) to be a discontinuous function.

(h) What is a jump discontinuity? Where does f(x) have a "jump" discontinuity?

(i) What is an infinite discontinuity? Where does f(x) have an infinite discontinuity?

(j) f h(x) = x + 2, what would the graph of y = f o h (x) look like? Why?

$f(x+2) \Rightarrow$ graph of f is translated 2 units to the Left

(k) If h(x) = x + 2, what would the graph of y = h o f (x) look like? Why?

$f(x) + 2 \Rightarrow$ graph of f is translated 2 units up

(l) What would the graph of y = -f(x) look like? Why?

a reflection across the x-axis b/c all y values have their sign changed by the -ve

(m) What would the graph of y = f(-x) look like? Why?

a reflection across the y-axis

(n) Explain how the graph of y = f(x) changes if you are asked to graphed y = | f(x) |

all parts of the graph of f that were BELOW the x axis are now reflected across x axis

(o) To determine the end behavior of the function, what does the function "do" as $x \to +\infty$ and what does the function "do" as $x \to -\infty$?

as $x \to +\infty$, $f(x) \to -\infty$ as the graph appears to go down on the right

as $x \to -\infty$, $f(x) \to 6$ as the graph levels off at $y=6$

(p) What does the term "bounded" mean and explain if/how it applies to y = f(x) & to y = g(x)

(q) Evaluate $\lim_{x \to -5^+} f(x)$ & $\lim_{x \to -5^-} f(x)$ & $\lim_{x \to -5} f(x)$ & f(-5).

$\lim_{x \to -5^+} f(x) = 0$ $\lim_{x \to -5^-} f(x) = 0$

$\lim_{x \to -5} f(x) = 0$ and $f(-5) = 0$

(r) Evaluate $\lim_{x \to -6^+} f(x)$ & $\lim_{x \to -6^-} f(x)$ & $\lim_{x \to -6} f(x)$ & f(-6)

(s) Graph the inverse relation for y = g(x).

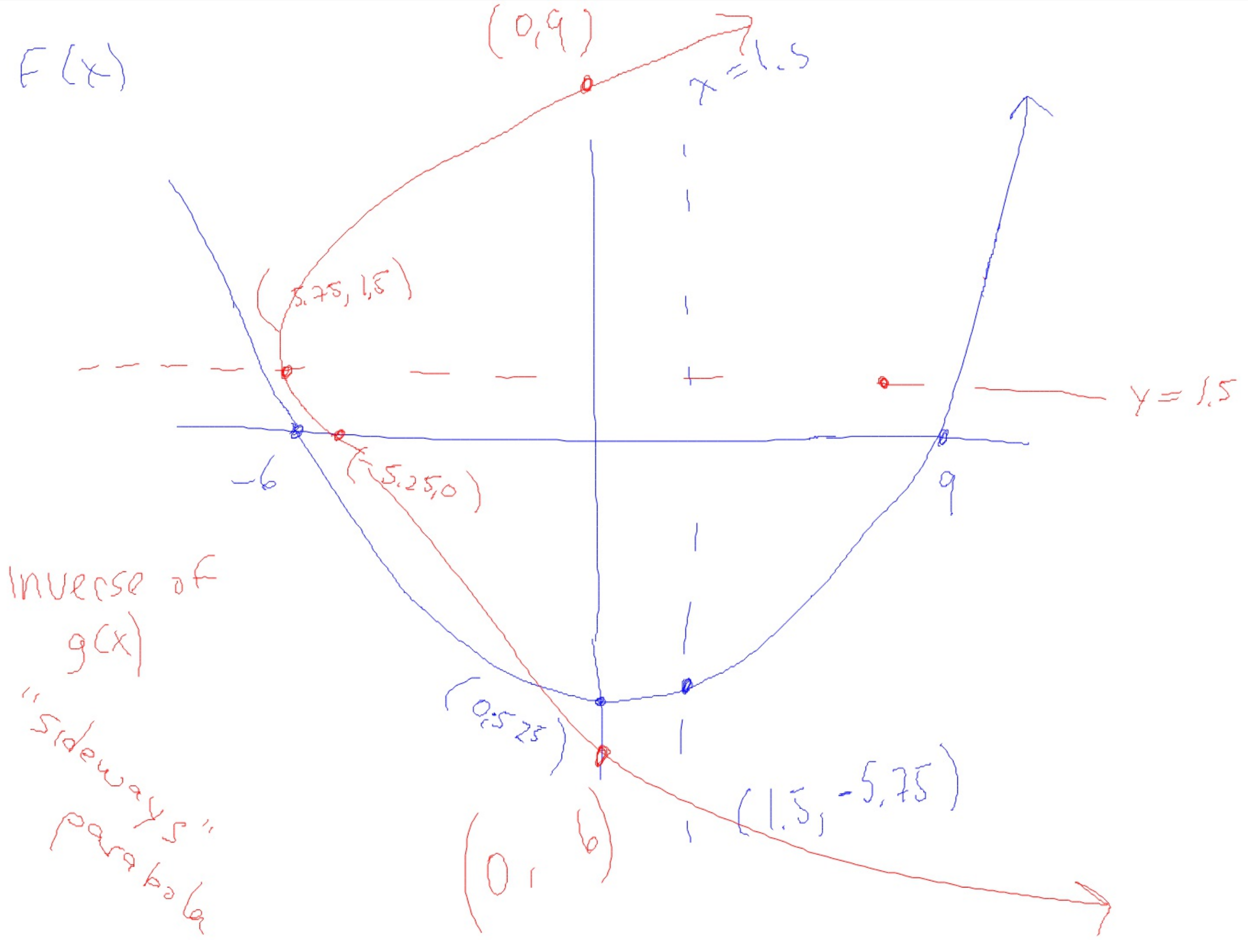
(t) Classify y = f(x) & y = g(x) as being either: (i) one to one, (ii) one to many, (iii) many to one, or (iv) many to many

f(x) one output → many inputs g(x) → one output to 2 inputs

(u) Which function(s) have/has symmetries : (i) f(x) only, (ii) g(x) only, (iii) both f(x) and g(x), (iv) neither f(x) nor g(x)

$\lim_{x \to -6^+} f(x) = -2$ $\lim_{x \to -6^-} f(x) = 9$ $\lim_{x \to -6} f(x) =$ does not exist

f(-6) → does not exist


F(x)
(0,9)
x = 1.5
(5.75, 1.5)
y = 1.5
-6
(-5.25,0)
9
Inverse of g(x)
"sideways" parabola
(0,-5.25)
(0, 6)
(1.5, -5.75)