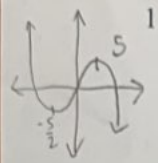
Hon Pre-Calc
Test Correction Quiz
Chapter 1

Name [redacted] 19/20

Show All Work!!! Circle All Final Answers!! No Calculators!!!

Short Answer



1. Determine over which intervals the function is increasing and decreasing.

$f(x) = -2x^3 + 9x^2 + 60x - 9$

$f'(x) = -6x^2 + 18x + 60$

$= -6(x^2 - 3x - 10)$

$x = \frac{3 \pm \sqrt{(-3)^2 - 4(1)(-10)}}{2}$

$x = \frac{3 \pm \sqrt{49}}{2}$

$x = \frac{3 \pm 7}{2}$, $x = 5$, $x = \frac{-4}{2}$

$x = \frac{3 \pm \sqrt{(-3)^2 - 4(1)(-10)}}{2}$

$x = \frac{3 \pm \sqrt{9 + 40}}{2}$

$x = \frac{3 \pm 7}{2}$

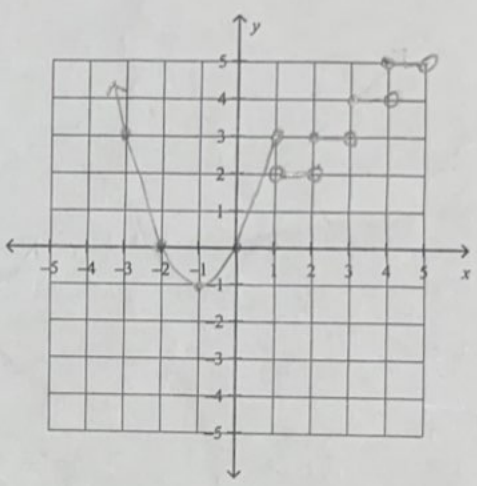
$x = 5, x = -2$

a) Increasing = $(-2, 5)$

b) Decreasing = $(-\infty, -2) \cup (5, \infty)$

2. Graph the following:

$$f(x) = \begin{cases} -1 + (x+1)^2, & x \le 1 \\ [x-1] + 2, & x > 1 \end{cases}$$



-1

$f(g(x)) = \frac{3}{(x+1)^2-4}$

3. Given: $f(x) = \frac{3}{x^2-4}$ and $g(x) = x+1$

a) Using interval notaion write the domain of $f(g(x))$

$-2 \neq x+1$ dom g: $(-\infty, \infty)$ range g: $(-\infty,-2) \cup (-2,2) \cup (2,\infty)$

$x \neq -3$

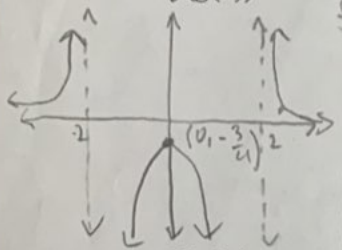
$(-\infty,-3) \cup (-3,1) \cup (1,\infty)$ dom f: $(-\infty,-2) \cup (-2,2) \cup (2,\infty)$

$2 \neq x+1$

$x \neq 1$

$\boxed{(-\infty,-3) \cup (-3,1) \cup (1,\infty)}$

b) Using interval notaion write the range of $f(g(x))$



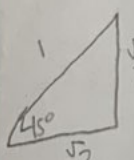
$f(0) = \frac{3}{(0)^2-4}$

$f(0) = -\frac{3}{4}$

$\boxed{(-\infty, -\frac{3}{4}] \cup (0,\infty)}$

4. Find the average rate of change from $x = \frac{\pi}{4}$ to $x = \frac{\pi}{4} + h$ using the difference quotient for the following function:

$f(x) = \sin x$



$a^2+b^2=c^2$

$\left(\frac{\sqrt{2}}{2}\right)^2+\left(\frac{\sqrt{2}}{2}\right)^2=(1)^2$

$\frac{2}{4}+\frac{2}{4}=1$

$1=1$ ✓

$= \frac{f(x+h)-f(x)}{h}$

$= \frac{f\left(\frac{\pi}{4}+h\right)-f\left(\frac{\pi}{4}\right)}{h}$

$= \frac{\sin\left(\frac{\pi}{4}+h\right)-\sin\left(\frac{\pi}{4}\right)}{h}$

$= \frac{\sin\frac{\pi}{4}\cosh + \cos\frac{\pi}{4}\sinh - \sin\frac{\pi}{4}}{h}$

$= \frac{\frac{\sqrt{2}}{2}\cosh + \frac{\sqrt{2}}{2}\sinh - \frac{\sqrt{2}}{2}}{h}$

$= \boxed{\frac{\sqrt{2}\cosh + \sqrt{2}\sinh - \sqrt{2}}{2h}}$

5. Verify that f and g are inverse functions.

$f(x) = \frac{x-1}{x+5}$ and $g(x) = -\frac{5x+1}{x-1}$

$g \circ f(x) = \frac{-\frac{5}{1}\left(\frac{x-1}{x+5}\right)+1}{\frac{x-1}{x+5}-\frac{x+5}{x+5}}$

$= \frac{\frac{-5x+5}{x+5}+\frac{x+5}{x+5}}{\frac{+6}{-x+5}}$

$= \frac{-6x}{x+5} \cdot \frac{x+5}{6}$

$= x$ ✓

$f \circ g(x) = \frac{-\frac{5x+1}{x-1}-\frac{x-1}{x-1}}{-\frac{5x+1}{x-1}+\frac{5x-5}{x-1}}$

$= \frac{\frac{-5x-1-(x-1)}{x-1}}{\frac{-5x-1+(5x-5)}{x-1}} = \frac{\frac{-6x}{x-1}}{\frac{-6}{x-1}}$

$= \frac{-6x}{x-1} \cdot \frac{x-1}{-6}$

$= x$ ✓