

Question 1:

(a)[3 points] Let $f(x) = \frac{1}{1-x^2}$ and $g(x) = \sqrt{x}$. Determine, simplify, and find the domain of $(f \circ g)(x)$.

(b)[3 points] Let $H(x) = \sqrt[8]{2+|x|}$ and $g(x) = 2+x$. Find functions f and h so that $H = f \circ g \circ h$. (There are several possible correct answers.)

(c)[4 points] Let $f(x) = \frac{1}{x^2}$. Evaluate and simplify $\frac{f(a+h) - f(a)}{h}$.

Question 2:

(a)[3 points] Evaluate: $\lim_{x \rightarrow -3} \frac{x^2 - \sqrt{x^2 - 9}}{x - 3}$

(b)[3 points] Evaluate: $\lim_{x \rightarrow 4} \frac{x^2 - x - 12}{x^2 - 7x + 12}$

(c)[4 points] Evaluate: $\lim_{x \rightarrow 0} \frac{x}{\sqrt{1 + 3x} - 1}$

Question 3:

(a)[5 points] Evaluate: $\lim_{\theta \rightarrow 0} \frac{3 \sin \theta}{2\theta - 5 \tan \theta}$

(b)[5 points] Evaluate: $\lim_{t \rightarrow 0} \left(\frac{1}{t} - \frac{1}{t^2 + t} \right)$

Question 4:

(a)[3 points] If $2x \leq g(x) \leq x^4 - x^2 + 2$ for every x , evaluate $\lim_{x \rightarrow 1} g(x)$. Be sure to state any theorems you use (the Squeeze Theorem, for example), and the conditions that are satisfied which justify use of the theorem.

(b)[3 points] Evaluate: $\lim_{x \rightarrow 2^+} \frac{\cos(\pi x)}{2 - x}$

(c)[4 points] Evaluate: $\lim_{x \rightarrow 2} \frac{\cos(\pi x)}{2 - x}$

Question 5:

(a)[5 points] Use the Intermediate Value Theorem to show that the equation

$$\cos x = 3 - 2x$$

has at least one real root on the interval $[0, \pi]$.

(b)[5 points] Evaluate: $\lim_{x \rightarrow -\infty} \frac{6x^7 - 7x^5 - 5}{7x^6 - 6x^5 + 5}$