

Question 1:

(a)[7 points] Let $f(x) = \frac{x^2}{1+x^2}$ and $g(x) = \sqrt{x-2}$. Compute and simplify $(f \circ g)(x)$ and state the domain.

(b)[3 points] Let $H(x) = \frac{\sin^2(x)}{\sqrt{1-\sin^2(x)}}$. If $g(x) = \sin(x)$ and $H = f \circ g$, what is $f(x)$?

Question 2:

(a)[5 points] Evaluate the following limit, if it exists: $\lim_{x \rightarrow -2} \frac{x^3 - 2x + 8}{x^2 - 2}$

(b)[5 points] Evaluate the following limit, if it exists: $\lim_{t \rightarrow 5} \frac{t^2 - t - 20}{t^2 - 9t + 20}$

Question 3:

(a)[5 points] Evaluate the following limit, if it exists: $\lim_{x \rightarrow 4} \frac{1 - \sqrt{5 - x}}{4 - x}$

(b)[5 points] Evaluate the following limit, if it exists: $\lim_{t \rightarrow \pi^-} \frac{\cos(t)}{t - \pi}$

Question 4:

(a)[5 points] Evaluate the following limit, if it exists: $\lim_{x \rightarrow \infty} \frac{5x^4 - 7x^2 + \pi}{-11x^4 + 7x^3 - 1}$

(b)[5 points] Evaluate the following limit, if it exists: $\lim_{\theta \rightarrow 0} \frac{\theta + \sin(3\theta)}{\theta - \sin(3\theta)}$

Question 5:

(a)[6 points] Use the definition of the derivative to find $f'(x)$ if $f(x) = \frac{1}{x^2}$.

(b)[4 points] Determine the equation of the tangent line to $y = \frac{1}{x^2}$ at the point where $x = 1$.
Your result from part (a) should be useful here.