

1) If $f(x) = x^3 - 5x^2 + 7x - 9$, use the Intermediate Value Theorem to show there is a real number, a , such that $f(a) = 100$.

2) Complete this definition:

a) $f(x)$ is continuous at a number $x = a$ if _____.

b) Let $f(x) = \begin{cases} c^2x & , & x < 1 \\ 3cx - 2, & & x \geq 1 \end{cases}$. Find all values of c such that f is continuous on \mathfrak{R} .

3) Evaluate, if possible: $\lim_{x \rightarrow -3} \frac{\sqrt{x+3}}{\sqrt[3]{x^3+27}}$

4a) State the formal ϵ, δ definition of the limit, $\lim_{x \rightarrow a} f(x) = L$.

b) Use part (a) to determine: $\lim_{x \rightarrow 6} \left(9 - \frac{x}{6} \right) = 8$.

5) Given $f(x) = \frac{x}{x+1}$, find $f'(x)$ using $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$.

6) Given $f(x) = \frac{1}{x^2} + \frac{1}{x}$ and $f'(x) = \frac{-2}{x^3} - \frac{1}{x^2}$ find the linear approximation, $L(x)$, at $x = \frac{1}{2}$. That is, find $L(x)$, such that $L(x) \approx f(x)$ as long as x is near $\frac{1}{2}$.

7) Evaluate, if possible: $\lim_{x \rightarrow \infty} \frac{4x-3}{\sqrt{x^2+1}}$.

8) For $k(x) = \frac{4x^3 - x^2 + 3}{x^2 - 9}$ determine the (a) vertical asymptote(s), if any (b) horizontal asymptote(s), if any.