Answer on Question #85727 – Math – Calculus

Question

Let f(x) = (pi x cube -5x+7)/(2x cube+ 7x-9);and g(x) = sin x be two real valued functions of a real variable defined on] 2,∞[such that h is their composite function g o f . Evaluate lim $_{x\to\infty}$ h(x)

Solution

If ***f(x)*** = $\frac{\pi x^3-5x+7}{2x^3+7x-9}$ and ***g(x)*** = *sin x* , then ***h(x)*** = ***g*** ○ ***f*** = ***g(f(x))*** = $sin(\frac{\pi x^3-5x+7}{2x^3+7x-9})$.

Since the function ***g(x)*** = *sin x* is continuous then $\lim_{x\to\infty}(h(x)) = \lim_{x\to\infty}\left(sin(\frac{\pi x^3-5x+7}{2x^3+7x-9})\right) =$

$$= sin(\lim_{x\to\infty}\left(\frac{\pi x^3-5x+7}{2x^3+7x-9}\right)) = sin(\lim_{x\to\infty}\left(\frac{\frac{\pi x^3}{x^3}-\frac{5x}{x^3}+\frac{7}{x^3}}{\frac{2x^3}{x^3}+\frac{7x}{x^3}-\frac{9}{x^3}}\right)) = sin(\lim_{x\to\infty}\left(\frac{\pi-\frac{5}{x^2}+\frac{7}{x^3}}{2+\frac{7}{x^2}-\frac{9}{x^3}}\right)) =$$

$$= sin\left(\frac{\pi-0+0}{2+0-0}\right) = sin\left(\frac{\pi}{2}\right) = 1$$

Answer:

$\lim_{x\to\infty}(h(x)) = 1$

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