

MATH 10A

① Calculate $\lim_{x \rightarrow 0} \frac{x^2 + 8x + 1}{4x^2 - 5}$, $\lim_{x \rightarrow +\infty} \frac{x^2 + 8x + 1}{4x^2 - 5}$

② Calculate $\lim_{x \rightarrow 0} \frac{3x^3 - 2x}{x^3 - \pi x^2}$, $\lim_{x \rightarrow 3} \frac{x^2 + 6x + 9}{x^3 - 9x}$

③ Only using limits, calculate $f'(4) \cdot g'(1)$, where:
 $f(x) = x^2$, $g(x) = x^3$

④ Define $a_{n+1} = (a_n)^2$, where $a_0 \geq 0$. What are the options for $\lim_{n \rightarrow \infty} a_n$? (Hint: do it by cases $a_0 < 1$, $a_0 = 1$, $a_0 > 1$)

⑤ For the Heaviside step function $H(x) = \begin{cases} 1 & x > 0 \\ 1/2 & x = 0 \\ 0 & x < 0 \end{cases}$

calculate $\lim_{x \rightarrow 0^+} H(x)$, $\lim_{x \rightarrow 0^-} H(x)$