CALCULUS
Limit problems
NEW

WARNING: In this homework, do NOT use l'Hôpital's rule. It has not been covered yet. Similarly, techniques of differentiation are unavailable.

NEW 0200-1. Suppose that $\lim_{s\to-\infty} p(s) = 2$,

$$\lim_{s\to-\infty} q(s) = -3 \quad \text{and} \quad \lim_{s\to-\infty} r(s) = 7.$$

a. Compute $\lim_{s\to-\infty} -2[p(s)] - 4[q(s)] + 8[r(s)]$.

b. Compute $\lim_{s\to-\infty} \dfrac{[p(s)]\sqrt[3]{(r(s)) - (p(s)) - (q(s))}}{\sqrt{(r(s)) + (q(s))}}$.

NEW 0200-2. Using the properties of limits, and explaining each step, compute

$$\lim_{s\to 2}\left(\left[\frac{\sqrt[4]{8+s^3}}{2s+\sqrt{7+s}}\right]+2(s-10)^{5/3}+7\right).$$

0200-3. a. Compute $\lim_{x \to 2^-} \dfrac{x^2 - 8x + 16}{(x-4)^3}$.
NEW

b. Compute $\lim_{x \to 2^+} \dfrac{x^2 - 8x + 16}{(x-4)^3}$.

c. Compute $\lim_{x \to 2} \dfrac{x^2 - 8x + 16}{(x-4)^3}$.

0200-4. NEW

a. Compute $\lim_{x \to 4^-} \frac{x^2 - 8x + 16}{(x-4)^3}$.

Do NOT use l'Hôpital's rule.

b. Compute $\lim_{x \to 4^+} \frac{x^2 - 8x + 16}{(x-4)^3}$.

Do NOT use l'Hôpital's rule.

c. Compute $\lim_{x \to 4} \frac{x^2 - 8x + 16}{(x-4)^3}$.

Do NOT use l'Hôpital's rule.

0200-5. a. Compute $\lim_{q \to -2^-} \dfrac{q^2 - 2q - 8}{(q+2)^2}$.
NEW

Do NOT use l'Hôpital's rule.

b. Compute $\lim_{q \to -2^+} \dfrac{q^2 - 2q - 8}{(q+2)^2}$.

Do NOT use l'Hôpital's rule.

c. Compute $\lim_{q \to -2} \dfrac{q^2 - 2q - 8}{(q+2)^2}$.

Do NOT use l'Hôpital's rule.

0200-6. Compute $\lim_{u \to 5} \frac{(u-2)(u-4)^5(u-5)}{(u-4)^7}$.
NEW

Do NOT use l'Hôpital's rule.

0200-7. Compute $\lim_{v \to 2^-} \frac{\sqrt{v+1}-3}{v-2}$.
NEW

0200-8. Compute $\lim_{w \to 9} \frac{\sqrt{w+7}-4}{w-9}$.
NEW

Do NOT use l'Hôpital's rule.

NEW 0200-9. Compute $\lim_{h \to 0} \frac{(-1+h)^6 - (-1)^6}{h}$.

Do NOT use l'Hôpital's rule.
Do NOT use differentiation.

NEW 0200-10. Compute $\lim_{h \to 0} \frac{(1+h)^{-3} - 1^{-3}}{h}$.

Do NOT use l'Hôpital's rule.
Do NOT use differentiation.

NEW 0200-11. Compute $\lim_{h \to 0} \frac{(9+h)^{-1/2} - 9^{-1/2}}{h}$.

Do NOT use l'Hôpital's rule.
Do NOT use differentiation.

0200-12. NEW Using the Squeeze Theorem,

show that $\lim\limits_{x \to 0} \left[x^2 - x\right]\left[\sin\left(\dfrac{5}{x}\right)\right] = 0$.

0200-13. NEW a. Compute $\lim\limits_{x \to 2^+} \dfrac{x^3 - 8}{|x - 2|}$.

b. Compute $\lim\limits_{x \to 2^-} \dfrac{x^3 - 8}{|x - 2|}$.

c. Compute $\lim\limits_{x \to 2} \dfrac{x^3 - 8}{|x - 2|}$.

0200-14. NEW Let $f(a) = \dfrac{2 - \sqrt{4 - 4a}}{2a}$.

By the Quadratic Equation, we see that

$$x = f(a) \text{ is a solution to } ax^2 - 2x + 1 = 0.$$

a. Compute $L := \lim_{a \to 0} f(a)$. Do NOT use l'Hôpital's rule.

b. Show that $x = L$ is the sol'n to $-2x + 1 = 0$.