CALCULUS

Limit problems

OLD

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

0200-1. Suppose that $\lim_{x\to 5} p(x) = 3$,

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$$\lim_{x\to 5} q(x) = -4 \text{ and } \lim_{x\to 5} r(x) = 2.$$

a. Compute $\lim_{x\to 5} [p(x)] - [q(x)] - 2[r(x)]$.

b. Compute $\lim_{x\to 5} \dfrac{[p(x)][q(x)]}{\sqrt[3]{r(x)}}$.

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

$$\lim_{x \to 3} \left(\left[\frac{\sqrt[5]{1+x^3}}{2x-1-\sqrt{x}} \right] + 2x^{4/3} + 8 \right).$$

0200-3. a. Compute $\lim_{x \to 2^-} \dfrac{x^2 - 8x + 15}{x - 4}$.

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b. Compute $\lim_{x \to 2^+} \dfrac{x^2 - 8x + 15}{x - 4}$.

c. Compute $\lim_{x \to 2} \dfrac{x^2 - 8x + 15}{x - 4}$.

0200-4. a. Compute $\lim_{x \to 4^-} \dfrac{x^2 - 8x + 15}{x - 4}$.

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b. Compute $\lim_{x \to 4^+} \dfrac{x^2 - 8x + 15}{x - 4}$.

c. Compute $\lim_{x \to 4} \dfrac{x^2 - 8x + 15}{x - 4}$.

0200-5. a. Compute $\lim_{x \to 4^-} \dfrac{x^2 - 7x + 12}{x - 4}$.

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Do NOT use l'Hôpital's rule.

b. Compute $\lim_{x \to 4^+} \dfrac{x^2 - 7x + 12}{x - 4}$.

Do NOT use l'Hôpital's rule.

c. Compute $\lim_{x \to 4} \dfrac{x^2 - 7x + 12}{x - 4}$.

Do NOT use l'Hôpital's rule.

OLD 0200-6. Compute $\lim_{x \to 4^-} \dfrac{(x-4)^3(x-5)^2(x-9)}{(x-4)^8}$.

Do NOT use l'Hôpital's rule.

OLD 0200-7. Compute $\lim_{x \to 1} \dfrac{\sqrt{x+8}-3}{x-1}$.

Do NOT use l'Hôpital's rule.

OLD 0200-8. Compute $\lim_{x \to 17} \dfrac{\sqrt{x+8}-3}{x-1}$.

OLD 0200-9. Compute $\lim_{h\to 0} \dfrac{(2+h)^3 - 2^3}{h}$.

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

OLD 0200-10. Compute $\lim_{h\to 0} \dfrac{(7+h)^{-1} - 7^{-1}}{h}$.

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

OLD 0200-11. Compute $\lim_{h\to 0} \dfrac{(3+h)^{1/2} - 3^{1/2}}{h}$.

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

0200-12.
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Using the Squeeze Theorem,

show that $\lim_{x \to 0^+} \left[x^2 + 4x + \sqrt{x}\right] \left[\sin\left(\frac{7}{x}\right)\right] = 0.$

0200-13.
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a. Compute $\lim_{x \to 2^+} \frac{x^3 - 8}{|x - 2|}.$

b. Compute $\lim_{x \to 2^-} \frac{x^3 - 8}{|x - 2|}.$

c. Compute $\lim_{x \to 2} \frac{x^3 - 8}{|x - 2|}.$

0200-14. Let $f(a) = \dfrac{-5 + \sqrt{25 - 16a}}{2a}$.
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By the Quadratic Equation, we see that

$x = f(a)$ is a solution to $ax^2 + 5x + 4 = 0$.

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 $5x + 4 = 0$.