CALCULUS

Limit problems

OLD2

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 $\lim_{t\to 5} u(t) = 1$,

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$$\lim_{t\to 5} v(t) = 4 \text{ and } \lim_{t\to 5} w(t) = -8.$$

a. Compute $\lim_{t\to 5} 3[u(t)] - 4[v(t)] + 5[w(t)]$.

b. Compute $\lim_{t\to 5} \dfrac{[u(t)]\sqrt[3]{w(t)}}{\sqrt{v(t)}}$.

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

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$$\lim_{u \to 2} \left(\left[\frac{\sqrt[4]{8+u^3}}{2u - \sqrt{7+u}} \right] + 2(u+6)^{4/3} - 8 \right).$$

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

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b. Compute $\lim_{x \to 2^+} \dfrac{x^2 - 8x + 15}{(x-4)^3}$.

c. Compute $\lim_{x \to 2} \dfrac{x^2 - 8x + 15}{(x-4)^3}$.

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

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b. Compute $\lim_{x \to 4^+} \dfrac{x^2 - 8x + 15}{(x-4)^3}$.

c. Compute $\lim_{x \to 4} \dfrac{x^2 - 8x + 15}{(x-4)^3}$.

0200-5. a. Compute $\lim_{s \to -2^-} \dfrac{s^2 - 2s - 8}{s + 2}$.

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Do NOT use l'Hôpital's rule.

b. Compute $\lim_{s \to -2^+} \dfrac{s^2 - 2s - 8}{s + 2}$.

Do NOT use l'Hôpital's rule.

c. Compute $\lim_{s \to -2} \dfrac{s^2 - 2s - 8}{s + 2}$.

Do NOT use l'Hôpital's rule.

0200-6. Compute $\lim_{q \to 4^-} \dfrac{(q-2)(q-4)^5(q-5)}{(q-4)^7}$.

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Do NOT use l'Hôpital's rule.

0200-7. Compute $\lim_{t \to 2} \dfrac{\sqrt{t+1}-3}{t-2}$.

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Do NOT use l'Hôpital's rule.

0200-8. Compute $\lim_{t \to 2} \dfrac{\sqrt{t+7}-3}{t-2}$.

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Do NOT use l'Hôpital's rule.

0200-9. Compute $\lim_{h\to 0} \dfrac{(3+h)^4 - 3^4}{h}$.
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Do NOT use l'Hôpital's rule.
Do NOT use differentiation.

0200-10. Compute $\lim_{h\to 0} \dfrac{(2+h)^{-1} - 2^{-1}}{h}$.
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Do NOT use l'Hôpital's rule.
Do NOT use differentiation.

0200-11. Compute $\lim_{h\to 0} \dfrac{(5+h)^{1/2} - 5^{1/2}}{h}$.
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Do NOT use l'Hôpital's rule.
Do NOT use differentiation.

0200-12.
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Using the Squeeze Theorem,

show that $\lim_{x \to 0^+} \left[x^3 + x + \sqrt{x}\right] \left[\cos\left(\frac{3}{x}\right)\right] = 0.$

0200-13.
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a. Compute $\lim_{x \to 2^+} \frac{x^2 - 4}{|x - 2|}.$

b. Compute $\lim_{x \to 2^-} \frac{x^2 - 4}{|x - 2|}.$

c. Compute $\lim_{x \to 2} \frac{x^2 - 4}{|x - 2|}.$

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 $-5x + 4 = 0$.