


Week 10 Tuesday Homework (1328507)

Question 12345678910111213141516

1. Question DetailsSCalcET6 4.4.AE.01. [1291590]

[Video Example](#) [Online Textbook](#)**EXAMPLE 1** Find the following limit.

$$\lim_{x \rightarrow 1} \frac{\ln(x)}{x-1}$$


SOLUTION Since

$$\lim_{x \rightarrow 1} \ln(x) = \ln(1) = \boxed{} \text{ and } \lim_{x \rightarrow 1} (x-1) = \boxed{}$$

we can apply l'Hospital's Rule:

$$\begin{aligned} \lim_{x \rightarrow 1} \frac{\ln(x)}{x-1} &= \lim_{x \rightarrow 1} \frac{\frac{d}{dx}(\ln(x))}{\frac{d}{dx}(x-1)} \\ &= \lim_{x \rightarrow 1} \frac{\boxed{}}{\boxed{}} = \lim_{x \rightarrow 1} \frac{\boxed{}}{x} = \boxed{} \end{aligned}$$

2. Question DetailsSCalcET6 4.4.AE.03. [1290736]

[Video Example](#) [Online Textbook](#)**EXAMPLE 3** Calculate the following limit.

$$\lim_{x \rightarrow \infty} \frac{\ln(3x)}{\sqrt[5]{x}}$$

SOLUTION Since $\ln(3x) \rightarrow \infty$ and

$$\boxed{} \rightarrow \infty \text{ as } x \rightarrow \infty, \text{ l'Hospital's Rule applies:}$$

$$\lim_{x \rightarrow \infty} \frac{\ln(3x)}{\sqrt[5]{x}} = \lim_{x \rightarrow \infty} \frac{1/x}{\frac{1}{5}x^{-4/5}}$$

Notice that the limit on the right side is now indeterminate of type $0/0$. But instead of applying l'Hospital's Rule a second time we simplify the expression and see that a second application is unnecessary:

$$\lim_{x \rightarrow \infty} \frac{\ln(3x)}{\sqrt[5]{x}} = \lim_{x \rightarrow \infty} \frac{1/x}{\frac{1}{5}x^{-4/5}} = \frac{5}{\sqrt[5]{x}} = \boxed{}$$

3. Question DetailsSCalcET6 4.4.AE.06. [1291186]

[Video Example](#) [Online Textbook](#)**EXAMPLE 6** Evaluate the following limit.

$$\lim_{x \rightarrow 0^+} x \ln(x^2)$$

SOLUTION The given limit is indeterminate because, as $x \rightarrow 0^+$, the first factor (x) approaches $\boxed{}$ while the second factor ($\ln(x^2)$) approaches $-\infty$. Writing $x = 1/(1/x)$, we have $1/x \rightarrow \infty$ as $x \rightarrow 0^+$, so l'Hospital's Rule gives

$$\begin{aligned} \lim_{x \rightarrow 0^+} x \ln(x^2) &= \lim_{x \rightarrow 0^+} \frac{\ln(x^2)}{1/x} = \lim_{x \rightarrow 0^+} \frac{2/x}{-1/x^2} \\ &= \lim_{x \rightarrow 0^+} \left(\boxed{} \right) = \boxed{} \end{aligned}$$

4. Question DetailsSCalcET6 4.4.Tut.01. [708872]

5. Question DetailsSCalcET6 4.4.001. [803655]

Consider the given limits (a is a constant, $f(x) \geq 0$).

$$\lim_{x \rightarrow a} f(x) = 0$$

$$\lim_{x \rightarrow a} g(x) = 0$$

$$\lim_{x \rightarrow a} h(x) = 1$$

$$\lim_{x \rightarrow a} p(x) = \infty$$

$$\lim_{x \rightarrow a} q(x) = \infty$$

Evaluate each limit below. If a limit is indeterminate, enter INDETERMINATE. (If you need to use $-\infty$ or ∞ , enter -INFINITY or INFINITY.)

(a) $\lim_{x \rightarrow a} \frac{f(x)}{g(x)}$

(b) $\lim_{x \rightarrow a} \frac{f(x)}{p(x)}$

(c) $\lim_{x \rightarrow a} \frac{h(x)}{p(x)}$

(d) $\lim_{x \rightarrow a} \frac{p(x)}{f(x)}$

(e) $\lim_{x \rightarrow a} \frac{p(x)}{q(x)}$

6. Question DetailsSCalcET6 4.4.008. [1291392]

Evaluate the limit.

$$\lim_{x \rightarrow 1} \frac{x^u - 1}{x^v - 1}$$

7. Question DetailsSCalcET6 4.4.010.MI. [1387263]
Evaluate the limit. (If you need to use $-\infty$ or ∞ , enter -INFINITY or INFINITY.)

$$\lim_{x \rightarrow 0} \frac{\sin(4x)}{\tan(9x)}$$

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8. Question Detailsscalcet6 4.4.015.mi.nva [1387103]
Evaluate the limit. (If you need to use $-\infty$ or ∞ , enter -INFINITY or INFINITY.)

$$\lim_{x \rightarrow \infty} \frac{\ln x}{\sqrt{x}}$$

9. Question DetailsSCalcET6 4.4.020. [1291073]
Evaluate the limit.

$$\lim_{x \rightarrow 1} \frac{\ln(x)}{\sin(4\pi x)}$$

10. Question DetailsSCalcET6 4.4.025. [1291320]
Evaluate the limit.

$$\lim_{t \rightarrow 0} \frac{3^t - 2^t}{t}$$

11. Question DetailsSCalcET6 4.4.029. [803651]
Evaluate the limit. (If you need to use $-\infty$ or ∞ , enter -INFINITY or INFINITY.)

$$\lim_{x \rightarrow 0} \frac{5 - 5 \cos(x)}{x^2}$$

12. Question DetailsSCalcET6 4.4.036. [803627]
Evaluate the limit. (If you need to use $-\infty$ or ∞ , enter -INFINITY or INFINITY.)

$$\lim_{x \rightarrow 0} \frac{e^{2x} - e^{-2x} - 4x}{x - \sin(x)}$$

13. Question DetailsSCalcET6 4.4.055.MI. [1387491]
Evaluate the limit.

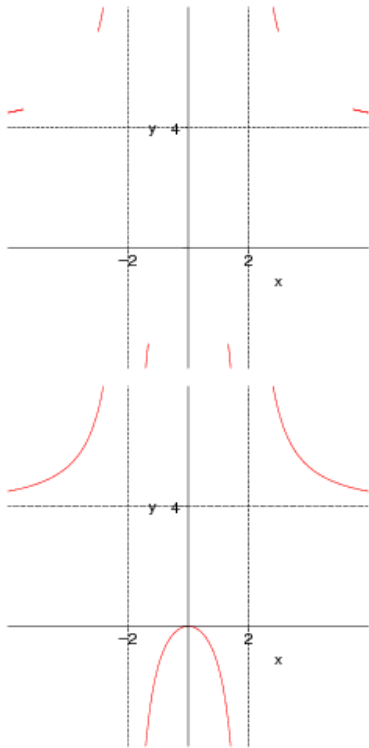
$$\lim_{x \rightarrow 0} (1 - 8x)^{1/x}$$

 [Tutorial](#)

14. Question DetailsSCalcET6 4.4.060. [1290518]
Evaluate the limit.

$$\lim_{x \rightarrow \infty} (e^x + x)^{5/x}$$

15. Question DetailsSCalcET6 4.5.AE.01. [703749]



[Video Example](#)

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EXAMPLE 1 Use the guidelines to sketch the curve.

$$y = \frac{4x^2}{x^2 - 4}$$

(A) The domain is $\{x \mid x^2 - 4 \neq 0\} = \{x \mid x \neq \pm 2\} = (-\infty, \boxed{}) \cup (\boxed{}, \boxed{}) \cup (\boxed{}, \infty)$

(B) The x - and y -intercepts are both 0.

(C) Since $f(-x) = f(x)$, the function is . The curve is symmetric about the y -axis.

(D) $\lim_{x \rightarrow \pm\infty} \frac{4x^2}{x^2 - 4} = \lim_{x \rightarrow \pm\infty} \frac{4}{1 - 4/x^2} = 4$

Therefore the line $y = \boxed{}$ is a horizontal asymptote. Since the denominator is 0 when $x = \pm 2$, we compute the following limits:

$$\begin{aligned} \lim_{x \rightarrow 2^+} \frac{4x^2}{x^2 - 4} &= \infty & \lim_{x \rightarrow 2^-} \frac{4x^2}{x^2 - 4} &= -\infty \\ \lim_{x \rightarrow -2^+} \frac{4x^2}{x^2 - 4} &= \text{---Select---} & \lim_{x \rightarrow -2^-} \frac{4x^2}{x^2 - 4} &= \text{---Select---} \end{aligned}$$

Therefore the lines $x = -2$ and $x = \boxed{}$ are vertical asymptotes. This information about limits and asymptotes enables us to draw the asymptotes in the top figure.

(E) $f'(x) = \frac{8x(x^2 - 4) - 4x^2(2x)}{(x^2 - 4)^2} = \frac{-32x}{(x^2 - 4)^2}$

Since $f'(x) > 0$ when $x < 0$ ($x \neq -2$) and $f'(x) < 0$ when $x > 0$ ($x \neq 2$), f is increasing on $(-\infty, \boxed{})$ and $(\boxed{}, \boxed{})$ and decreasing on $(\boxed{}, \boxed{})$ and $(\boxed{}, \infty)$.

(F) The only critical number is $x = \boxed{}$. Since f' changes from positive to negative at 0, $f(0) = 0$ is a local maximum by the First Derivative Test.

(G) $f''(x) = \frac{-32(x^2 - 4)^2 + 32x \cdot 2(x^2 - 4)2x}{(x^2 - 4)^4} = \frac{96x^2 + 128}{(x^2 - 4)^3}$

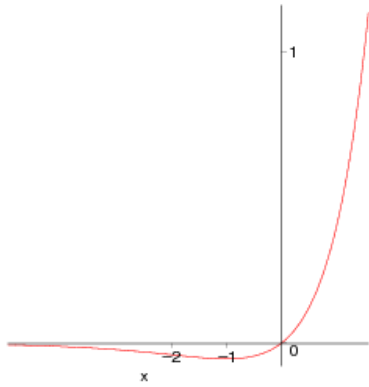
Since $96x^2 + 128 > 0$ for all x , we have

$$f''(x) > 0 \Leftrightarrow x^2 - 4 > 0 \Leftrightarrow |x| > \boxed{}$$

and $f''(x) < 0 \Leftrightarrow |x| < \boxed{}$. Thus the curve is concave down on $(\boxed{}, \boxed{})$. It has no point of inflection since 2 and $\boxed{}$ are not in the domain of f .

(H) Using the information in parts (E)-(G), we finish the sketch in the figure.

16. Question DetailsSCalcET6 4.5.AE.03. [1291296]



[Video Example](#)

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EXAMPLE 3 Sketch the graph of $f(x) = 7xe^x$.

(A) The domain of f is \mathbb{R}

(B) The x - and y -intercepts are both .

(C) Symmetry: None

(D) Because both $7x$ and e^x become large as $x \rightarrow \infty$, we have the limit of $7xe^x$ as $x \rightarrow \infty$ is ∞ . As $x \rightarrow -\infty$, however, $e^x \rightarrow$ and so we have an indeterminate product that requires the use of l'Hospital's Rule:

$$\begin{aligned} \lim_{x \rightarrow -\infty} 7xe^x &= \lim_{x \rightarrow -\infty} \frac{7x}{e^{-x}} = \lim_{x \rightarrow -\infty} \frac{7}{\text{[]}} \\ &= \lim_{x \rightarrow -\infty} -7e^x = \text{[]} \end{aligned}$$

Thus the x -axis is a horizontal asymptote.

(E) $f'(x) = 7xe^x + 7e^x =$

Since e^x is always positive, we see that $f'(x) > 0$ when $1 + x > 0$, and $f'(x) < 0$ when $1 + x < 0$. So f is increasing on (, ∞) and decreasing on ($-\infty$,).

(F) Because $f'(-1) =$ and f' changes from positive to negative at $x =$, $f'(-1) = -7e^{-1}$ is a local (and absolute) minimum.

(G) $f''(x) = (7 + 7x)e^x + 7e^x =$

Since $f''(x) > 0$ if $x >$ and $f''(x) < 0$ if $x <$, f is concave upward on (, ∞) and concave downward on ($-\infty$,). The inflection point is $(-2,$).

(H) We use this information to sketch the curve in the figure.

Assignment Details

Name (AD): **Week 10 Tuesday Homework (1328507)**

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