

## 201-203-RE - Practice Set #16: l'Hospital's Rule

Evaluate the following limits, using l'Hospital's rule where appropriate.

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|---|--|---|
| (1) $\lim_{x \rightarrow \infty} \frac{2x^3 + \sqrt{x}}{3 - 5x^3}$              | (9) $\lim_{x \rightarrow 2} \frac{\cos(x-2) + 2x - 5}{x - 4 + 2e^{x-2}}$                               | (17) $\lim_{x \rightarrow 0} \frac{x^2 - e^{2x} + \cos(x)}{3x^2 + \sin(3x)}$                  |
| (2) $\lim_{x \rightarrow 0} \frac{e^{-3x} + x^3 - 1}{1 - e^{5x}}$               | (10) $\lim_{x \rightarrow \infty} \frac{\sqrt{x+2} + 5\sqrt{x+3}}{\sqrt{4x+1}}$                        | (18) $\lim_{x \rightarrow \pi} \frac{\sin(x) - \tan(x)}{\cos(x) - \sin(x) + 1}$               |
| (3) $\lim_{x \rightarrow 0} \frac{e^x - x^2 - 1}{\sin(2x)}$                     | (11) $\lim_{x \rightarrow 0} \frac{6x^3 - 5x}{e^x - 1}$  | (19) $\lim_{x \rightarrow -1} \frac{x^3 + x^2 + 4x + 4}{x^3 + 3x^2 + 6x + 4}$                 |
| (4) $\lim_{x \rightarrow 0} \frac{e^x - x^3 - 1}{\sin\left(\frac{x}{2}\right)}$ | (12) $\lim_{x \rightarrow -2} \frac{3x^3 + 11x^2 + 8x - 4}{5x^3 + 21x^2 + 24x + 4}$                    | (20) $\lim_{x \rightarrow \infty} \frac{\sqrt{4x^2 + 3}}{9 - x}$                              |
| (5) $\lim_{x \rightarrow \infty} \frac{4e^{3x} - x^2}{1 + x + 6e^{3x}}$         | (13) $\lim_{x \rightarrow 3} \frac{x^2 - 4x + 5}{3x^2 - 5x + 2}$                                       | (21) $\lim_{x \rightarrow 0} \frac{4x + 1 - e^{2x}}{4e^{3x} - 4}$                             |
| (6) $\lim_{x \rightarrow \infty} \frac{e^{2/x} - 3x^2}{4x^2 - e^{3/x}}$         | (14) $\lim_{x \rightarrow \infty} \frac{(3x-4)^3}{9x^2 - 5x^3}$  | (22) $\lim_{x \rightarrow \pi^-} \frac{\sin(x)\tan(x) - \cos(x)}{\sec(x)[\sin(x) - \cos(x)]}$ |
| (7) $\lim_{x \rightarrow 0} \frac{\cos(3x) - 5x - 1}{\tan(2x)}$                 | (15) $\lim_{x \rightarrow \pi} \frac{\sin(3x) + \pi - x}{2 - \sec\left(\frac{x}{3}\right) + \tan(2x)}$ | (23) $\lim_{x \rightarrow -\infty} \frac{x^2 - e^{3x}}{e^{2x} + 3x^2}$                        |
| (8) $\lim_{x \rightarrow \pi} \frac{3\sin(x) + 2\tan(3x)}{4\tan(2x) - x + \pi}$ | (16) $\lim_{x \rightarrow 2^+} \frac{2 - x - e^{x-2}}{x^2 - 4}$  | (24) $\lim_{x \rightarrow \infty} \frac{(2x-1)^3}{(4x+1)^3}$                                  |
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### ANSWERS:

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|------------|----------------------|-------------|
| (1) $-2/5$ | (9) $2/3$            | (17) $-2/3$ |
| (2) $3/5$  | (10) $3$             | (18) $-2$   |
| (3) $1/2$  | (11) $-5$            | (19) $5/3$  |
| (4) $2$    | (12) $7/9$           | (20) $-2$   |
| (5) $2/3$  | (13) $1/7$           | (21) $1/6$  |
| (6) $-3/4$ | (14) $-27/5$         | (22) $-1$   |
| (7) $-5/2$ | (15) $-\sqrt{3} - 3$ | (23) $1/3$  |
| (8) $3/7$  | (16) $-\infty$       | (24) $1/8$  |