

AP Calculus AB 1.5 and 1.6 Name: _____

Limits with Infinity and Horizontal/Vertical Asymptotes

For #1 to #5, evaluate each limit and then identify the horizontal asymptotes. If there is not horizontal asymptote, then find the oblique asymptote.

1. $\lim_{x \rightarrow \infty} \frac{x^3 + 8x - 4}{2x^3 + 3}$

2. $\lim_{x \rightarrow \infty} \frac{x^2 - 1}{2x^3 - 8x^2 + 3}$

3. $\lim_{x \rightarrow \infty} \frac{x^5 - x - 1}{6x^3}$

4. $\lim_{x \rightarrow \infty} \frac{x + 1}{x^2 - 1}$

5. $\lim_{x \rightarrow \infty} \frac{x^2 - 1}{x + 1}$

For #6 to #8, use a graphing calculator to evaluate each limit and then identify the vertical asymptotes.

6. $\lim_{x \rightarrow 2^-} \frac{5x^2 + x}{x - 2}$

7. $\lim_{x \rightarrow -3} \frac{1}{(x + 3)^2}$

8. $\lim_{x \rightarrow 1} \frac{x}{(1 - x)^3}$

+

For #9 to #12, find the horizontal asymptotes of each rational function.

9. $f(x) = \frac{5e^{-x} + 1}{6e^x - 1}$

10. $f(x) = \frac{5x}{|x|}$

11. $f(x) = \frac{\sqrt{x^2 + x}}{4x}$

12. $f(x) = \frac{5e^x + 1}{6e^x - 1}$

ANSWERS:

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|-------------------------|-----------------------|-----------------------|
| 1) $1/2, y = 1/2$ | 6) $-\infty, x = 2$ | 11) $y = \pm 1/4$ |
| 2) $0, y = 0$ | 7) $+\infty, x = -3$ | 12) $y = -1, y = 5/6$ |
| 3) none, $y = 1/(6x^2)$ | 8) $\pm\infty, x = 1$ | |
| 4) $0, y = 0$ | 9) $y = 0$ | |
| 5) none, none | 10) $y = \pm 5$ | |