1.(1 pt) Evaluate the limit

$$\lim_{x\to\infty} \sqrt{x^2+8x+4}-x$$

2.(1 pt) The function

$$\sqrt{x^2+4x+7}-x$$

has one horizontal asymptote at $y =$ _____

3.(1 pt)
Evaluate the limit using L'Hopital's rule

$$\lim_{x\to\infty} \frac{6x^3}{e^{2x}}$$

4.(1 pt)
Evaluate the limit using L'Hopital's rule

$$\lim_{x\to\frac{\pi}{2}} 9\cos(-3x)\sec(-7x)$$

5.(1 pt) Compute the following limit using l'Hôpital's rule if appropriate. Use INF to denote ∞ and MINF to denote $-\infty$.

$\lim_{x\to\infty} (\sqrt[3]{x^3-6x^2}-x) =$ _____

6.(1 pt)
Evaluate the limit using L'Hospital's rule if necessary

$$\lim_{x\to 0} \frac{e^x-1}{\sin(12x)}$$

7.(1 pt)
Evaluate the limit using L'Hospital's rule if necessary

$$\lim_{x\to 0} \frac{\sin(7x)}{\sin(10x)}$$

8.(1 pt)
Evaluate the limit using L'Hospital's rule

$$\lim_{x\to 0} \frac{\sin(6x)}{\tan(7x)}$$

9.(1 pt)
Evaluate the limit using L'Hospital's rule if necessary

$$\lim_{x\to 0} \frac{14^x-7^x}{x}$$

10.(1 pt) Compute the following limits using l'Hôpital's rule if appropriate. Use INF to denote ∞ and MINF to denote $-\infty$.

$\lim_{x\to 1} \frac{7^x-7}{x^2-1} =$ _____

$\lim_{x\to\infty} \frac{\tan^{-1}(x)}{(1/x)-7} =$ _____

11.(1 pt) Compute the following limits using l'Hôpital's rule if appropriate. Use INF to denote ∞ and MINF to denote $-\infty$.

$\lim_{x\to 0} \frac{1-\cos(4x)}{1-\cos(8x)} =$ _____

$\lim_{x\to 1} \frac{9^x-8^x-1}{x^2-1} =$ _____

12.(1 pt) Compute the following limits using l'Hôpital's rule if appropriate. Use INF to denote ∞ and MINF to denote $-\infty$.

$\lim_{x\to\infty} \frac{\ln(x^6-4)}{\ln(x)\cos(1/x)} =$ _____

$\lim_{x\to\infty} \frac{e^{4x}}{e^{5x}-e^{-5x}} =$ _____

13.(1 pt) Compute the following limit using l'Hôpital's rule if appropriate. Use INF to denote ∞ and MINF to denote $-\infty$.

$\lim_{x\to 0^+} 2\sin(x)\ln(x) =$ _____

14.(1 pt) Find the following limits, using l'Hôpital's rule if appropriate

$\lim_{x\to\infty} \frac{\arctan(x^5)}{x^4} =$ _____

$\lim_{x\to 0^+} \sqrt[4]{x}\ln(x) =$ _____

15.(1 pt)
Evaluate the limit using L'Hospital's rule if necessary

$$\lim_{x\to\infty} 14xe^{1/x}-14x$$

16.(1 pt)
Evaluate the limit using L'Hospital's rule if necessary

$$\lim_{x\to\infty} \left(\frac{15x}{15x+8}\right)^{8x}$$

17.(1 pt) Compute the following limit using l'Hôpital's rule if appropriate. Use INF to denote ∞ and MINF to denote $-\infty$.

$\lim_{x\to\infty} \left(1-\frac{7}{x}\right)^x =$ _____

18.(1 pt)
Evaluate the limit using L'Hospital's rule if necessary

$$\lim_{x\to\infty} \left(1+\frac{11}{x}\right)^{\frac{x}{9}}$$

19.(1 pt)
Evaluate the limit using L'Hospital's rule if necessary

$$\lim_{x\to\infty} (3x)^{\frac{\ln 9+1}{\ln(8x)+1}}$$

20.(1 pt) For each of the following forms determine whether the following limit type is indeterminate, always has a fixed finite value, or never has a fixed finite value. In the first case answer IND, in the second case enter the numerical value, and in the third case answer DNE. For example

IND $\frac{0}{0}$

0 $\frac{0}{1}$

DNE $\frac{1}{0}$

To discourage blind guessing, this problem is graded on the following scale
0-9 correct = 0
10-13 correct = .3
14-16 correct = .5
17-19 correct = .7
Note that l'Hôpital's rule (in some form) may ONLY be applied to indeterminate forms.

___ 1. $1^{-\infty}$
___ 2. $\frac{1}{-\infty}$
___ 3. ∞^1
___ 4. ∞^{∞}
___ 5. $\infty \cdot \infty$
___ 6. $1 \cdot \infty$
___ 7. $0 \cdot \infty$
___ 8. ∞^{-e}
___ 9. $\pi^{-\infty}$
___ 10. 1^{∞}
___ 11. $\frac{0}{\infty}$
___ 12. π^{∞}
___ 13. 1^0
___ 14. $\frac{\infty}{0}$
___ 15. $\infty - \infty$
___ 16. $0^{-\infty}$
___ 17. 0^0
___ 18. ∞^0
___ 19. 0^{∞}
___ 20. $\infty^{-\infty}$

21.(1 pt) Find the following limits, using L'Hôpital's rule, if appropriate. Use INF to denote ∞ and MINF to denote $-\infty$

(a) $\lim_{x\to\infty} \frac{\tan^{-1}(x/6)}{\sin^{-1}(1/x)} =$ _____

(b) $\lim_{x\to 0} \frac{x\cos^5(\pi e^{x^{11}})}{\ln(1+6x)} =$ _____