

Due date: _____

Name: _____

1. Find the following limits.

a) $\lim_{x \rightarrow 0^-} e^{\csc x}$

b) $\lim_{x \rightarrow (\pi/2)^+} \frac{x}{\sec x}$

c) $\lim_{x \rightarrow 2^+} \ln(x^2 - 4)$

d) $\lim_{x \rightarrow 0^-} \ln|x|$

e) $\lim_{x \rightarrow 3^-} |\ln(9 - x^2)|$

f) $\lim_{x \rightarrow 4^-} \frac{1}{\ln(2 - \sqrt{x})}$

g) $\lim_{x \rightarrow 1^-} \tan^{-1}\left(\frac{1}{x-1}\right)$

h) $\lim_{x \rightarrow \infty} \tan^{-1}(x^2 - 5)$

i) $\lim_{x \rightarrow \infty} \frac{2}{\tan^{-1}(1 - e^x)}$

2. Find the following limits.

a) $\lim_{x \rightarrow -2} \frac{x^2 + 2x}{3x^2 + 7x + 2}$

b) $\lim_{x \rightarrow 7} \frac{x^2 - 4x - 21}{x - 7}$

c) $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2}$

d) $\lim_{x \rightarrow -2^-} \frac{3x + 1}{x + 2}$

e) $\lim_{x \rightarrow -1^-} \frac{2x + 3}{x + 1}$

f) $\lim_{x \rightarrow -\frac{\pi}{2}^+} \frac{\sin x}{2x + \pi}$

g) $\lim_{x \rightarrow 2} \frac{4 - x}{(x - 2)^2}$

h) $\lim_{x \rightarrow -3} \frac{x + 1}{(x + 3)^3}$

i) $\lim_{x \rightarrow -1^-} \frac{x^2 + x - 2}{2x^2 + x - 1}$

j) $\lim_{x \rightarrow -1/2} \frac{(x + 1)^2}{(2x + 1)(x - 1)}$

$$k) \lim_{x \rightarrow -1} \frac{x+3}{(x+1)^4}$$

$$l) \lim_{x \rightarrow 2^-} \frac{x^2+5x+4}{x^2-x-2}$$

$$m) \lim_{x \rightarrow -3^+} \frac{2x^2+5x-3}{3x^2+11x+6}$$

$$n) \lim_{x \rightarrow 0} \frac{5x^3-2x^2}{x^2+x}$$

3. Find the following limits.

$$a) \lim_{x \rightarrow 6} \frac{\sqrt{x-2}-2}{x-6}$$

$$b) \lim_{x \rightarrow 1} \frac{\sqrt{x+2}-\sqrt{3}}{x(x-1)}$$

$$\text{c) } \lim_{x \rightarrow 0} \frac{\frac{1}{x+4} - \frac{1}{4}}{x}$$

$$\text{d) } \lim_{x \rightarrow 0} \frac{\frac{1}{x-3} + \frac{1}{3}}{x(x-1)}$$

4. Find the following limits.

$$\text{a) } \lim_{x \rightarrow \infty} \frac{2x^3 + 2}{x^3 - 9x^2 + 1}$$

$$\text{b) } \lim_{x \rightarrow -\infty} \frac{x^4 + 2x - 2}{3x - 5}$$

$$\text{c) } \lim_{x \rightarrow \infty} \frac{x^3 + 3x - 4}{-2x^2 + 5}$$

$$\text{d) } \lim_{x \rightarrow \infty} \frac{3 - x^3}{1 - 2x}$$

$$\text{e) } \lim_{x \rightarrow \infty} \frac{x - 2}{\sqrt{4x^2 + 3x} - 1}$$

$$\text{f) } \lim_{x \rightarrow -\infty} \frac{\sqrt{9x^2 - x}}{2x + 7}$$

$$\text{g) } \lim_{x \rightarrow 2^-} \frac{\sqrt{x^3 + x}}{x - 2}$$

$$\text{h) } \lim_{x \rightarrow -\infty} \frac{\sqrt[3]{x} - 5x + 3}{x^{2/3} + 2x - 4}$$

$$\text{i) } \lim_{x \rightarrow \infty} (2x - \sqrt{4x^2 - 5})$$

$$\text{j) } \lim_{x \rightarrow -\infty} (\sqrt{x^2 + 3} + x)$$

5. Find the following limits.

$$\text{a) } \lim_{x \rightarrow 0^+} (e^{-1/x} - \cot x)$$

$$\text{b) } \lim_{x \rightarrow 0^+} \left(\ln x - \frac{1}{x} \right)$$

c) $\lim_{x \rightarrow (\pi/2)^-} (\tan x + \csc(\frac{\pi}{2} - x))$

d) $\lim_{x \rightarrow (\pi/2)^+} (\sec x + \ln(x - \frac{\pi}{2}))$

6. Use the Squeeze Theorem to prove that $\lim_{x \rightarrow 0} x^4 \cos\left(\frac{1}{x} + 3\right) = 0$.

7. Use the Squeeze Theorem to prove that $\lim_{x \rightarrow 0} x^6 \sin\left(2 + \frac{1}{x}\right) = 0$.

8. Use the Squeeze Theorem to prove that $\lim_{x \rightarrow 1} (x - 1)^2 \cos\left(\frac{2}{x-1}\right) = 0$.

9. Use the Squeeze Theorem to prove that $\lim_{x \rightarrow \infty} e^{-x} \cos x = 0$.

10. Given that $1 - \frac{x^2}{4} \leq g(x) \leq 1 + \frac{x^2}{2}$ for all $x \neq 0$, find $\lim_{x \rightarrow 0} g(x)$ by using the Squeeze Theorem.

Optional exercises from the Stewart textbook if you'd like more practice:

2.2 (p.92) #31-43 odd

2.3 (p.102) #11-27 odd, 35 (don't graph), 37, 39, 47

2.6 (p.137) #15-41 odd, 47-51 odd