Name: ________________________ Date: __________________

Learning Goal 4.2	The Mean Value Theorem and L'Hospital's Rule

More Questions – Solutions

1. Evaluate.

a. $\lim_{x \to \pi^-} \frac{\sin x}{1 - \cos x}$

$$\lim_{x \to \pi^-} \frac{\sin x}{1 - \cos x} = \frac{\lim_{x \to \pi^-} \sin x}{\lim_{x \to \pi^-} 1 - \cos x}$$
$$= \frac{0}{2}$$
$$= 0$$

b. $\lim_{x \to 3} \frac{x^2 - 9}{x - 3}$

$$\lim_{x \to 3} \frac{x^2 - 9}{x - 3} = \frac{\lim_{x \to 3}(x^2 - 9)}{\lim_{x \to 3}(x - 3)}$$
$$= \frac{0}{0}$$
$$=^H \frac{\lim_{x \to 3}(2x)}{\lim_{x \to 3}(1)}$$
$$= 6$$

c. $\lim_{x \to \infty} \frac{1 - x}{2x}$

$$\lim_{x \to \infty} \frac{1 - x}{2x} = \frac{\lim_{x \to \infty}(1 - x)}{\lim_{x \to \infty}(2x)}$$
$$= \frac{-\infty}{\infty}$$
$$=^H \frac{\lim_{x \to \infty}(-1)}{\lim_{x \to \infty}(2)}$$
$$= -\frac{1}{2}$$

d. $\lim_{x \to \infty} \frac{1 - x^2}{2x}$

$$\lim_{x \to \infty} \frac{1 - x^2}{2x} = \frac{\lim_{x \to \infty}(1 - x^2)}{\lim_{x \to \infty}(2x)}$$
$$= \frac{-\infty}{\infty}$$
$$=^H \frac{\lim_{x \to \infty}(-2x)}{\lim_{x \to \infty}(2)}$$
$$= -\infty$$

e. $\lim_{x\to\pi} \frac{x^2 - \pi^2}{\sin x}$

$$\lim_{x\to\pi} \frac{x^2 - \pi^2}{\sin x} = \frac{\lim_{x\to\pi}(x^2 - \pi^2)}{\lim_{x\to\pi}(\sin x)}$$
$$= \frac{0}{0}$$
$$=^H \frac{\lim_{x\to\pi}(2x)}{\lim_{x\to\pi}(\cos x)}$$
$$= \frac{2\pi}{-1}$$
$$= -2\pi$$

f. $\lim_{x\to\infty} \frac{2x^2 - 3x + 7}{x^2 + 47x + 1}$

$$\lim_{x\to\infty} \frac{2x^2 - 3x + 7}{x^2 + 47x + 1} = \frac{\lim_{x\to\infty}(2x^2 - 3x + 7)}{\lim_{x\to\infty}(x^2 + 47x + 1)}$$
$$= \frac{\infty}{\infty}$$
$$=^H \frac{\lim_{x\to\infty}(4x - 3)}{\lim_{x\to\infty}(2x + 47)}$$
$$= \frac{\infty}{\infty}$$
$$=^H \frac{\lim_{x\to\infty}(4)}{\lim_{x\to\infty}(2)}$$
$$= 2$$

g. $\lim_{x\to 0} \frac{\sec x - 1}{\sin x}$

$$\lim_{x\to 0} \frac{\sec x - 1}{\sin x} = \frac{\lim_{x\to 0}(\sec x - 1)}{\lim_{x\to 0}(\sin x)}$$
$$= \frac{0}{0}$$
$$=^H \frac{\lim_{x\to 0}(\sec x \tan x)}{\lim_{x\to 0}(\cos x)}$$
$$= \frac{0}{1}$$
$$= 0$$

h. $\lim_{x\to 0^+} \frac{1/x^2}{\ln x}$

$$\lim_{x\to 0^+} \frac{1/x^2}{\ln x} = \frac{\lim_{x\to 0^+}\left(1/x^2\right)}{\lim_{x\to 0^+}(\ln x)}$$
$$= \frac{\infty}{-\infty}$$
$$=^H \lim_{x\to 0^+} \frac{-2/x^3}{1/x}$$
$$= \lim_{x\to 0^+} -\frac{2}{x^2}$$
$$= -\infty$$

Assignment # 5 – 33 Quiz Next Day!