True or False?

1) If f(c) =M, then $\lim_{x \to c} f(x)$ =M

2) If f(c) does not exist, then $\lim_{x \to c} f(x)$ DNE

BOTH ARE FALSE (sometimes)

1.3 - Evaluating Limits Analytically $\lim_{x \to c} f(x)$

DIRECT SUBSTITUTION can be used IF the function is continuous at c.

1) $\lim_{x \to 2} 5x - 4$

$5(2) - 4$

6

2) $\lim_{x \to 3} x^2 + 2x$

$3^2 + 2(3)$

15

3) $\lim_{x \to 5} 7$

7

4) $\lim_{x \to 0} \frac{x^2 - 5}{x - 4}$

disc
@x=4

$\frac{0^2 - 5}{0 - 4} = 5/4$

If the function is NOT continuous at c, determine if the discontinuity is ...

* removable (hole) $\longrightarrow$ Limit exists

non-removable (asymptote or jump) $\longrightarrow$ Limit DNE

Techniques for evaluating limits at points of removable discontinuity (holes)

i) FACTOR & SIMPLIFY to rewrite f(x) as a similar function

5) $$\lim_{x\to 3} \frac{2x^2-7x+3}{x-3}$$

$$\lim_{x\to 3} \frac{(2x-1)\cancel{(x-3)}}{\cancel{x-3}}$$ hole $x=3$ $(3,5)$

$$\lim_{x\to 3} 2x-1 = 5$$

6) $$\lim_{x \to 3} \frac{x^3 - 27}{x - 3}$$

$$\lim_{x \to 3} \frac{\cancel{(x-3)}(x^2+3x+9)}{\cancel{x-3}}$$

$$\lim_{x \to 3} x^2+3x+9$$

$$3^2+3(3)+9$$

$$27$$

7) $$\lim_{x\to 7}\frac{\frac{x-2}{x-2}\cdot\frac{1}{5}-\frac{1}{x-2}\cdot\frac{5}{5}}{x-7}$$

$$\lim_{x\to 7}\frac{\frac{x-2}{5x-10}-\frac{5}{5x-10}}{x-7}$$

$$\lim_{x\to 7}\frac{\frac{x-7}{5x-10}}{x-7}$$

$$\lim_{x\to 7}\frac{\cancel{x-7}}{5x-10}\cdot\frac{1}{\cancel{x-7}}$$

$$\lim_{x\to 7}\frac{1}{5x-10}$$

$$=\frac{1}{25}$$

7) $$\lim_{x\to 7}\frac{\frac{1}{5}-\frac{1}{x-2}}{x-7}\cdot\frac{5(x-2)}{5(x-2)}$$

$$\lim_{x\to 7}\frac{\cancel{x-2-5}}{\cancel{(x-7)}5(x-2)}$$

$$\lim_{x\to 7}\frac{1}{5x-10}$$

ii) RATIONALIZE the Numerator or Denominator & SIMPLIFY to rewrite f(x) as a similar function.

8) $$\lim_{x\to 0} \frac{x}{1-\sqrt{1-x}} \cdot \frac{1+\sqrt{1-x}}{1+\sqrt{1-x}}$$

$$\lim_{x\to 0} \frac{x\left(1+\sqrt{1-x}\right)}{1-(1-x)}$$

$$\lim_{x\to 0} \frac{x\left(1+\sqrt{1-x}\right)}{x}$$ hole @ $x=0$

$$\lim_{x\to 0} \frac{1+\sqrt{1-x}}{\quad}$$

2

9) $$\lim_{x\to 0} \frac{2-\sqrt{4-x}}{x} \cdot \frac{2+\sqrt{4-x}}{2+\sqrt{4-x}}$$

$$\lim_{x\to 0} \frac{4-(4-x)}{x(2+\sqrt{4-x})}$$

$$\lim_{x\to 0} \frac{x}{x(2+\sqrt{4-x})}$$

$$\lim_{x\to 0} \frac{1}{2+\sqrt{4-x}} = \frac{1}{4}$$

$\boxed{1.3}$

HW: Pg. 67 #5-21, 49-57

ODDS