DATE: ___________

Evaluating Limits Analytically – Multiple Choice

1. $\lim_{x\to 2}\frac{x^2-4}{x^2+4}$ is:

(A) 1
$\boxed{\text{(B)}}$ 0
(C) $-\frac{1}{2}$
(D) -1
(E) ∞

$$\lim_{x\to 2}\frac{x^2-4}{x^2+4} = \frac{2^2-4}{2^2+4} = \frac{0}{8} = \boxed{0}$$

---

2. $\lim_{x\to 3}\frac{x-3}{x^2-2x-3}$ is:

(A) 0
(B) 1
$\boxed{\text{(C)}}$ $\frac{1}{4}$
(D) ∞
(E) none of these

$$\lim_{x\to 3}\frac{x-3}{x^2-2x-3} \to \frac{3-3}{3^2-2(3)-3} = \frac{0}{0} \ \frown$$
$$= \lim_{x\to 3}\frac{\cancel{x-3}}{(\cancel{x-3})(x+1)}$$
$$= \lim_{x\to 3}\frac{1}{x+1} = \frac{1}{3+1}$$
$$= \boxed{\frac{1}{4}}$$

---

3. $\lim_{x\to 0}\frac{x}{x}$ is:

$\boxed{\text{(A)}}$ 1
(B) 0
(C) ∞
(D) -1
(E) nonexistent

$$\lim_{x\to 0}\frac{x}{x} \to \frac{0}{0} \ \frown$$
$$\lim_{x\to 0}\frac{\cancel{x}}{\cancel{x}} = \lim_{x\to 0} 1$$
$$= \boxed{1}$$

---

4. Evaluate the limit, if it exists: $\lim_{x\to 9}\frac{\sqrt{x-5}-2}{x-9}$

$\boxed{\text{(A)}}$ $\frac{1}{4}$
(B) $-\frac{1}{4}$
(C) 1
(D) 0
(E) The limit does not exist

$$\to \frac{\sqrt{9-5}-2}{9-9} = \frac{0}{0} \ \frown$$
$$\lim_{x\to 9}\frac{\sqrt{x-5}-2}{x-9}\cdot\frac{\sqrt{x-5}+2}{\sqrt{x-5}+2}$$
$$= \lim_{x\to 9}\frac{x-5-4}{(x-9)(\sqrt{x-5}+2)}$$
$$= \lim_{x\to 9}\frac{x-9}{(x-9)(\sqrt{x-5}+2)}$$
$$= \lim_{x\to 9}\frac{1}{\sqrt{x-5}+2} = \frac{1}{\sqrt{9-5}+2} = \frac{1}{2+2} = \boxed{\frac{1}{4}}$$

---

5. Evaluate the limit: $\lim_{x\to 0}\frac{\sin x}{x^2+3x}$

$$\to \frac{\sin 0}{0^2+3(0)} = \frac{0}{0} \ \frown$$

(A) 1
$\boxed{\text{(B)}}$ $\frac{1}{3}$
(C) 3
(D) ∞
(E) $\frac{1}{4}$

$$= \lim_{x\to 0}\frac{\sin x}{x(x+3)}$$
$$= \lim_{x\to 0}\left(\frac{\sin x}{x}\cdot\frac{1}{x+3}\right)$$
$$= \lim_{x\to 0}\frac{\sin x}{x}\cdot\lim_{x\to 0}\frac{1}{x+3}$$
$$= 1\cdot\frac{1}{0+3}$$
$$= \boxed{\frac{1}{3}}$$