

**CALCULUS 12****THE SANDWICH THEOREM****The Police Theorem or The Pinching theorem**

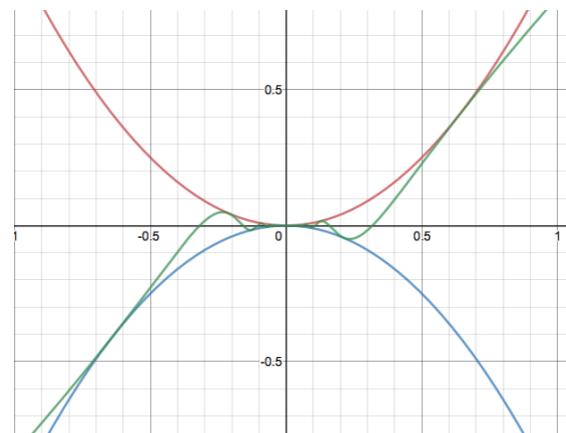
If  $g(x) \leq f(x) \leq h(x)$  for all  $x \neq c$  in some interval about  $c$ , and

$$\lim_{x \rightarrow c} g(x) = \lim_{x \rightarrow c} h(x) = L,$$

then

$$\lim_{x \rightarrow c} f(x) = L$$

**Example:** Using the Sandwich Theorem, show that  $\lim_{x \rightarrow 0} [x^2 \sin \left( \frac{1}{x} \right)] = 0$ .



# Important Graphs

$f(x) = x \sin(x)$	$f(x) = x \cos(x)$
$f(x) = \sin\left(\frac{1}{x}\right)$	$f(x) = \cos\left(\frac{1}{x}\right)$
$f(x) = \frac{1}{x^2}$	$f(x) = \frac{\sin x}{x}$
$f(x) = \frac{\cos x}{x}$	$f(x) = \frac{x}{ x }$

Example 2: Using the Sandwich Theorem and properties of trigonometric functions find the limit of  $\lim_{x \rightarrow 0} \frac{\sin x}{x}$