Problem 1.1 *Determine if the limit approaches a finite number, $\pm\infty$, or does not exist. (If the limit does not exist, write DNE)*

$$\lim_{x\to 3}\frac{x^2-8\,x+15}{x-3}=\boxed{-2}$$

Problem 2.2 *Determine if the limit approaches a finite number, $\pm\infty$, or does not exist. (If the limit does not exist, write DNE)*

$$\lim_{x\to -4^+}-\frac{5}{(x+4)^2}=\boxed{-\infty}$$

Problem 3.3 *Determine if the limit approaches a finite number, $\pm\infty$, or does not exist. (If the limit does not exist, write DNE)*

$$\lim_{h\to 0}\frac{-3\sqrt{h+1}+3}{h}=\boxed{-\frac{3}{2}}$$

Problem 4.4 *Let* $f(x)=\begin{cases} -x+1 & , \quad x<3 \\ e^{(x-6)} & , \quad 3\le x\le 6 \\ x-1 & , \quad x>6 \end{cases}$.

Find the numbers at which f is discontinuous: $x=\boxed{3,6}$
(If no such numbers exist, enter "None")

At which of these points of discontinuity is f continuous from the right?
$x=\boxed{3}$ *(If no such numbers exist, enter "None")*

At which of these points of discontinuity is f continuous from the left?
$x=\boxed{6}$ *(If no such numbers exist, enter "None")*

Problem 5.5 *The limit as $x\to 13$ of $f(x)=(x-13)^3\cos\left(\frac{17}{x-13}\right)$ is 0. What is the reason why this is true?*

Multiple Choice:

(a) *The statement is in fact false:* $\lim_{x\to 13}(x-13)^3\cos\left(\frac{17}{x-13}\right)\neq 0$.

(b) *The cosine factor decreases to 0 faster than the polynomial.*

(c) *The cosine factor is bounded between -1 and 1, so the polynomial forces the function to 0.* ✓

(d) *The cosine factor directly cancels out the polynomial factor.*

What is the name of the theorem that applies to this problem?
The $\boxed{\textit{Squeeze}}$ *Theorem*

Problem 6 *Let* $f(x) = \begin{cases} x^2 + 5\,x + 2 & , \quad x \le 0 \\ (x-1)^2 & , \quad 0 < x \le 4 \\ x^2 - 5\,x + 13 & , \quad x > 4 \end{cases}$.

Find the numbers at which f is discontinuous: $x = \boxed{0}$
(If no such numbers exist, enter "None")

At which of these points of discontinuity is f continuous from the right?
$x = \boxed{None}$ *(If no such numbers exist, enter "None")*

At which of these points of discontinuity is f continuous from the left?
$x = \boxed{0}$ *(If no such numbers exist, enter "None")*

Problem 7 *Let* $f(x) = \begin{cases} (x+1)^2 + 17 & , \quad x \le 2 \\ (x+3)^2 & , \quad 2 < x \le 5 \\ x^2 - x + 44 & , \quad x > 5 \end{cases}$.

Find the numbers at which f is discontinuous: $x = \boxed{2}$
(If no such numbers exist, enter "None")

At which of these points of discontinuity is f continuous from the right?
$x = \boxed{None}$ *(If no such numbers exist, enter "None")*

At which of these points of discontinuity is f continuous from the left?
$x = \boxed{2}$ *(If no such numbers exist, enter "None")*

Problem 8 *Let* $f(x) = \begin{cases} x^2 - 9 & , \quad x \le 2 \\ x^2 - 3\,x - 4 & , \quad 2 < x \le 6 \\ x^2 - 22 & , \quad x > 6 \end{cases}$.

Find the numbers at which f is discontinuous: $x = \boxed{2}$
(If no such numbers exist, enter "None")

At which of these points of discontinuity is f continuous from the right?
$x = \boxed{None}$ *(If no such numbers exist, enter "None")*

At which of these points of discontinuity is f continuous from the left?
$x = \boxed{2}$ *(If no such numbers exist, enter "None")*

Problem 9 *Let* $f(x) = \begin{cases} -x + 3 & , \quad x < -3 \\ e^{(x-2)} & , \quad -3 \le x \le 2 \\ (x-3)^2 & , \quad x > 2 \end{cases}$.

Find the numbers at which f is discontinuous: $x = \boxed{-3, 2}$
(If no such numbers exist, enter "None")

At which of these points of discontinuity is f continuous from the right?
$x = \boxed{-3}$ *(If no such numbers exist, enter "None")*

At which of these points of discontinuity is f continuous from the left?
$x = \boxed{2}$ *(If no such numbers exist, enter "None")*

Problem 10 *Let* $f(x) = \begin{cases} (x+1)^2 & , \quad x < -1 \\ e^x & , \quad -1 \le x \le 4 \\ x^2 + 3\,x + 2 & , \quad x > 4 \end{cases}$.

Find the numbers at which f is discontinuous: $x = \boxed{-1, 4}$
(If no such numbers exist, enter "None")

At which of these points of discontinuity is f continuous from the right?
$x = \boxed{-1}$ *(If no such numbers exist, enter "None")*

At which of these points of discontinuity is f continuous from the left?
$x = \boxed{4}$ *(If no such numbers exist, enter "None")*

Problem 11 *Determine if the limit approaches a finite number, infinity, or does not exist. (If the limit does not exist, write DNE)*

$$\lim_{x \to -1} 5\,(x+2)(x-5)\cos\left(-\frac{2}{3}\,\pi x\right) = \boxed{15}$$

Problem 12 *Determine if the limit approaches a finite number, infinity, or does not exist. (If the limit does not exist, write DNE)*

$$\lim_{x \to 3} -5\left(x^3 + 2\,x^2 - 13\,x + 10\right)\sin\left(\frac{2}{3}\,\pi x\right) = \boxed{0}$$

Problem 13 *Let* $f(x) = \begin{cases} x & , \quad x \le 1 \\ x - 1 & , \quad 1 < x \le 4 \\ (x-1)^2 - 6 & , \quad x > 4 \end{cases}$.

Find the numbers at which f is discontinuous: $x = \boxed{1}$
(If no such numbers exist, enter "None")

At which of these points of discontinuity is f continuous from the right?
$x = \boxed{None}$ *(If no such numbers exist, enter "None")*

At which of these points of discontinuity is f continuous from the left?
$x = \boxed{1}$ *(If no such numbers exist, enter "None")*

Problem 14 *Let* $f(x) = \begin{cases} x - 2 & , \quad x < -1 \\ \cos(x) & , \quad -1 \le x \le 3 \\ -x + 2 & , \quad x > 3 \end{cases}$.

Find the numbers at which f is discontinuous: $x = \boxed{-1, 3}$
(If no such numbers exist, enter "None")

At which of these points of discontinuity is f continuous from the right?
$x = \boxed{-1}$ *(If no such numbers exist, enter "None")*

At which of these points of discontinuity is f continuous from the left?
$x = \boxed{3}$ *(If no such numbers exist, enter "None")*

Problem 15 *Let* $f(x) = \begin{cases} x+6 & , \quad x < -2 \\ e^x & , \quad -2 \le x \le 3 \\ (x+6)^2 & , \quad x > 3 \end{cases}$.

Find the numbers at which f is discontinuous: $x = \boxed{-2, 3}$
(If no such numbers exist, enter "None")

At which of these points of discontinuity is f continuous from the right?
$x = \boxed{-2}$ *(If no such numbers exist, enter "None")*

At which of these points of discontinuity is f continuous from the left?
$x = \boxed{3}$ *(If no such numbers exist, enter "None")*

Problem 16 *Determine if the limit approaches a finite number, $\pm\infty$, or does not exist. (If the limit does not exist, write DNE)*

$$\lim_{x \to -9} \frac{x^2 + 9\,x}{x + 9} = \boxed{-9}$$

Problem 17 *Determine if the limit approaches a finite number, $\pm\infty$, or does not exist. (If the limit does not exist, write DNE)*

$$\lim_{x \to -3} \frac{x^2 + 4\,x + 3}{x + 3} = \boxed{-2}$$

Problem 18 *Determine if the limit approaches a finite number, infinity, or does not exist. (If the limit does not exist, write DNE)*

$$\lim_{x \to +\infty} \frac{x^3 + 4\,x^2 + 5\,x + 2}{x^2 - 9} = \boxed{+\infty}$$

Problem 19 *Determine if the limit approaches a finite number, $\pm\infty$, or does not exist. (If the limit does not exist, write DNE)*

$$\lim_{x \to \infty} -\frac{\sqrt{2\,x^6 + 5} + 1}{3\,x^3 + 5} = \boxed{-\frac{1}{3}\sqrt{2}}$$

Problem 20 *Determine if the limit approaches a finite number, $\pm\infty$, or does not exist. (If the limit does not exist, write DNE)*

$$\lim_{x \to \infty} -\frac{\sqrt{3\,x^6 - 3} - 3}{x^3 - 5} = \boxed{-\sqrt{3}}$$

Test question here

Problem 21 *Why won't this work?*
