

SCORE: ____ / 30 POINTS

NO CALCULATORS ALLOWED**SHOW PROPER ALGEBRAIC WORK AND USE PROPER NOTATION**
**YOU DO NOT NEED TO SHOW THE USE OF THE LIMIT LAWS
UNLESS SPECIFICALLY ASKED FOR**

State the complete definition of "vertical asymptote".

SCORE: ____ / 2 POINTS

SEE 7:30 VERSION A

State the Squeeze Theorem.

SCORE: ____ / 2 POINTS

SEE 7:30 VERSION A

$$\text{Let } f(x) = \begin{cases} 3x+17, & \text{if } x < -3 \\ 5-x, & \text{if } -3 \leq x < 2 \\ 11-4x, & \text{if } x > 2 \end{cases}$$

SCORE: ____ / 7 POINTS

[a] Is $f(x)$ continuous at $x = 2$?

If yes, show that all three conditions of continuity are satisfied. If no, show that at least one condition is not satisfied.

NO. $f(2)$ DNE
[b] Is $f(x)$ continuous at $x = -3$?

If yes, show that all three conditions of continuity are satisfied. If no, show that at least one condition is not satisfied.

YES.

$$\frac{1}{2} \quad f(-3) = 5 - (-3) = 8$$

$$\frac{1}{2} \quad \lim_{x \rightarrow -3^+} f(x) = \lim_{x \rightarrow -3^+} (5 - x) = 8$$

$$\lim_{x \rightarrow -3^-} f(x) = \lim_{x \rightarrow -3^-} (3x + 17) = 8$$

$$\frac{1}{2} \quad \lim_{x \rightarrow -3} f(x) = 8 = f(-3)$$

Evaluate the following limits.

SCORE: ___ / 14 POINTS

The answer should be a number, ∞ or $-\infty$. Write DNE only if the other possibilities do not apply.

[a] $\lim_{t \rightarrow -1} \frac{t+1}{3-\sqrt{t^2+8}} \quad \frac{0}{0}$

[b] $\lim_{x \rightarrow 4^+} \frac{x^3-8}{4-x}$

$\frac{56}{0^-}$ OR $\frac{x^3-8 \rightarrow 56}{4-x \rightarrow 0^-}$

$= \lim_{t \rightarrow -1} \frac{(t+1)(3+\sqrt{t^2+8})}{9-(t^2+8)}$

$= \frac{-\infty}{1}$

$= \lim_{t \rightarrow -1} \frac{(t+1)(3+\sqrt{t^2+8})}{1-t^2}$

$= \lim_{t \rightarrow -1} \frac{(t+1)(3+\sqrt{t^2+8})}{(1-t)(1+t)}$

1 FOR FACTORING DENOMINATOR
1 FOR CANCELLING

$= \frac{6}{2}$

$= \boxed{3}$

SUBTRACT 1 POINT TOTAL
IF YOU FORGOT ANY OF THESE

[c] $\lim_{c \rightarrow 2} \frac{9-c^2}{c-2} \quad \frac{0}{0}$

[d] $\lim_{y \rightarrow 3} \frac{y^3+8}{2y^2+3y-12} = \frac{35}{15} = \frac{7}{3}$

$= \lim_{c \rightarrow 2} \frac{9-3(c+1)}{(c-2)(c+1)}$

$= \lim_{c \rightarrow 2} \frac{6-3c}{(c-2)(c+1)}$

$= \lim_{c \rightarrow 2} \frac{-3(c-2)}{(c-2)(c+1)}$

1 FOR FACTORING NUMERATOR
1 FOR CANCELLING

$= \frac{-3}{3}$

$= \boxed{-1}$

The graphs of f and g are shown on the right.

SCORE: ___ / 5 POINTS

Find $\lim_{x \rightarrow 2} [5f(x) - xg(x)]$, showing the proper use of the limit laws to justify your answer.

$= \lim_{x \rightarrow 2} [5f(x)] - \lim_{x \rightarrow 2} [xg(x)]$

$= \lim_{x \rightarrow 2} 5 \lim_{x \rightarrow 2} f(x) - \lim_{x \rightarrow 2} x \lim_{x \rightarrow 2} g(x)$

$= 5(-3) - 2(3)$

$= \boxed{-21}$

