What month is your birthday ?
What are the first 2 digits of your address ?
What are the last 2 digits of your zip code ?
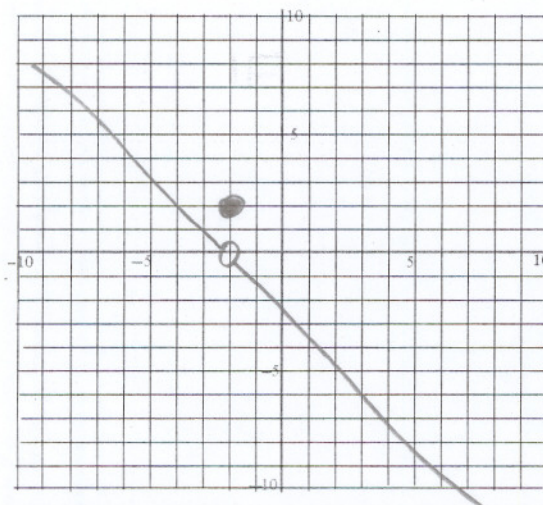What are the last 2 digits of your social security number ?
**[IF YOU DO NOT HAVE A SOCIAL SECURITY NUMBER, USE YOUR STUDENT ID NUMBER]**

# NO CALCULATORS ALLOWED

Give the definition of "continuous at a point".  SCORE: ___ / 2 POINTS

*f* IS CONTINUOUS AT x=a IF

$f(a)$ EXISTS, $\lim\limits_{x \to a} f(x)$ EXISTS, AND $\lim\limits_{x \to a} f(x) = f(a)$

½ POINT EACH

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Sketch a function $f$ such that $\lim\limits_{x \to -2} f(x)$ exists and $f(-2)$ exists, but $\lim\limits_{x \to -2} f(x) \neq f(-2)$.  SCORE: ___ / 2 POINTS



INFINITELY MANY ANSWERS

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Determine if the function below is continuous at $x = 1$.
**If it is not continuous, state which of the conditions is not met.**  SCORE: ___ / 3 POINTS

$$f(x) = \begin{cases} 3 - x & \text{if } x \leq -2 \\ x + 6 & \text{if } -2 < x < 1 \\ 5x + 2 & \text{if } x > 1 \end{cases}$$

$f(1)$ DNE, SO *f* IS NOT CONTINUOUS AT x=1

2

IF YOU THOUGHT *f* WAS CONTINUOUS AT x=1, AND YOU SHOWED THAT $\lim\limits_{x \to 1^-} f(x) = \lim\limits_{x \to 1^+} f(x) = 7$, GIVE YOURSELF 1 POINT TOTAL

**CONTINUED ON OTHER SIDE**  (YOU'RE STILL WRONG)

Evaluate the following limits. **Show supporting work.**                    **SCORE: ___ / 7 POINTS**
If a limit does not exist, write DNE, and show supporting work and/or give a **_brief_** explanation.

[a]   $\lim\limits_{x \to -3^+} \sqrt{x^2 - 9}$   $\boxed{\text{DNE}}$          [b]   $\lim\limits_{x \to 1}\left( \dfrac{1}{x-1} - \dfrac{2}{x^2-1} \right)$

IF $x \approx -3$

AND $\boxed{x > -3}$ (E6. $x = -2.99$)          $= \boxed{\lim\limits_{x \to 1} \dfrac{(x+1) - 2}{(x-1)(x+1)}}$

THEN $x^2 < 9$

SO $\boxed{x^2 - 9 < 0}$          $= \boxed{\lim\limits_{x \to 1} \dfrac{x - 1}{(x-1)(x+1)}}$

AND $\sqrt{x^2 - 9}$ IS UNDEFINED

          $= \boxed{\lim\limits_{x \to 1} \dfrac{1}{x+1}}$

1   POINT EACH          $= \dfrac{1}{1+1}$

          $= \boxed{\dfrac{1}{2}}$

For the position function $f(t) = t^2 + 2t$, find the velocity at time $t = 2$. **DO NOT USE DERIVATIVES.**          **SCORE: ___ / 3 POINTS**

$\lim\limits_{h \to 0} \dfrac{f(2+h) - f(2)}{h}$

$= \lim\limits_{h \to 0} \dfrac{(2+h)^2 + 2(2+h) - 8}{h}$                    $= \boxed{\lim\limits_{h \to 0} (6 + h)}$

$= \boxed{\lim\limits_{h \to 0} \dfrac{4 + 4h + h^2 + 4 + 2h - 8}{h}}$          $= \boxed{6}$

$= \lim\limits_{h \to 0} \dfrac{6h + h^2}{h}$                    1 POINT EACH

**[MULTIPLE CHOICE]** Find $\lim\limits_{x \to 0} f(x)$ where $f(x) = \begin{cases} 2x+3 & \text{if } x < 1 \\ 4 & \text{if } x = 1 \\ 5 - 2x & \text{if } x > 1 \end{cases}$.          **SCORE: ___ / 2 POINTS**

[a]   3          [b]   4          [c]   5          [d]   does not exist

LETTER OF CORRECT ANSWER: $\boxed{\text{A}}$   2 POINTS

## MONDAY IS MARTIN LUTHER KING DAY
## ENJOY THE LONG WEEKEND
## BUT GET READY FOR THE MIDTERM