Math 1151 Midterm 2

Name: ____________________

OSU name.#: ____________________

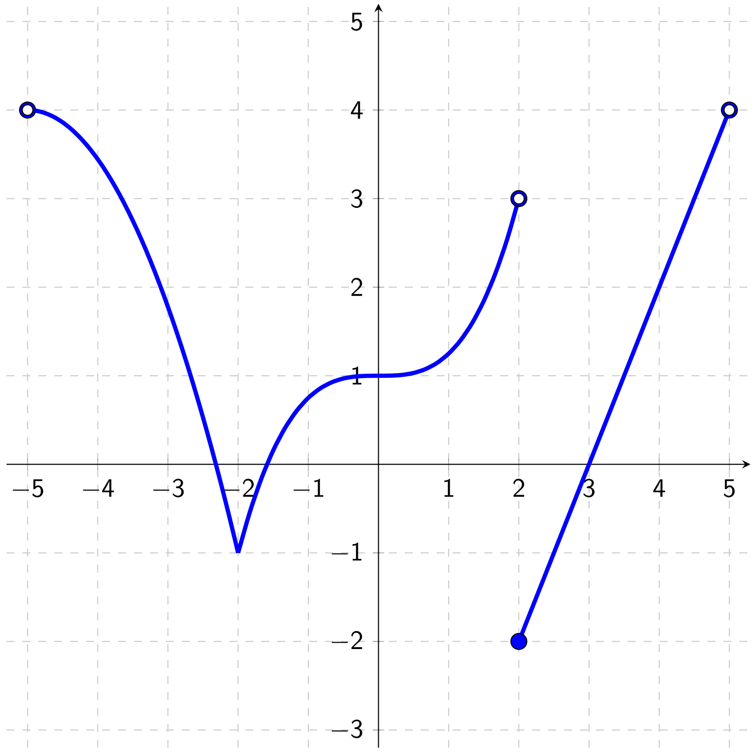
Instructions:

- **Show all relevant supporting work** to receive full credit in Problems 2 and 3.
  Incorrect answers with substantially correct work may receive partial credit.
  Unsubstantiated answers will receive no credit.
  Using a table of values or L'Hôpitals Rule are **not considered valid support** for computing limits.
  Using graphs not given in this assignment are **not considered valid support** for computing limits.
- Give **exact** answers unless instructed to do otherwise.
  Intervals should be expressed **simplified in interval notation**.
  If a requested value does not exist, write "DNE". Write that limits "DNE" only if they do not exist and are neither ∞ nor $-\infty$.
- You are expected to **evaluate any trigonometric functions at standard angles**.
- Calculators are permitted except those that have symbolic algebra or calculus capabilities.
- You are allowed to use your notes on this exam, as well as any materials in the Carmen course, but no other websites.
  All work on this exam must be your own.
  You are not allowed to post these questions online or ask for help from other people, or online sources.
- Your solutions are to be uploaded to Gradescope as a single pdf file.

SIGN YOUR NAME:

Question	Points	Score
1	16	
2	24	
3	20	
Total:	60	

1) The graph of a function f with domain $(-5, 5)$ is given in the figure below.



a) (1 point) $f(-2) =$ ______________

c) (2 points) $\lim_{x \to 4} \frac{f(x) - 2}{x - 4} =$ ______________

b) (1 point) $f'(0) =$ ______________

d) (2 points) **Sketch** the line **tangent** to f at the point corresponding to $x = -1$. **Label it as** T**.**

e) (2 points) **Sketch** the **secant line** through the points corresponding to $x = 0$ and $x = 1$. **Label it as** S**.**

f) (2 points) Which one of these values is **least**? A, B, or C: ________

$(A)\ f'(3.25)$ $(B)\ f'(0.5)$ $(C)\ f'(-3.5)$

g) (2 points) Which one of these values is **greatest**? A, B, or C : ________

$(A)\ f'(3.25)$ $(B)\ f'(0.5)$ $(C)\ f'(-3.5)$

h) (2 points) For which x-values in $(-5, 5)$ does $f'(x)$ **not exist**?

$x - VALUES$: ________

i) (2 points) Suppose a differentiable function g has values as given in the table.

x	$g(x)$	$g'(x)$
0	3	4
1	2	-3
2	5	7

If $k(x) = 2g(x)\sqrt{x}$, **find the value** of $k'(1)$.

$k'(1) =$ ________

2) a) (12 points) Recall that the definition of the derivative of a function f at a point a is given by

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

If $g(x) = \dfrac{5}{2x+6}$, **use this limit definition of the derivative** to evaluate $g'(2)$.
(No credit for using the Rules of Differentiation.)

$g'(2) =$ ____________

b) (12 points) A continuous function k has values as given in the table.

x	0	1	2	3	4	5	6
$k(x)$	-3	2	5	-1	6	2	5

Explain how the **Intermediate Value Theorem** (IVT) can be used to show that the equation

$$k(x) + \cos\left(\frac{\pi}{2}x\right) = \sqrt{3}$$

has a solution on the interval $(3, 4)$. Make sure that the conditions of the IVT are satisfied before you apply the theorem.

Hint: apply the IVT to f(x) = k(x) + cos(π/2).

3) An object is traveling along the horizontal line below with displacement function

$$s(t) = \frac{2\sin(t)}{e^t}$$

with s measured in feet and t measured in hours.

a) (5 points) Find a formula for the instantaneous velocity function, $v(t)$.

$v(t) =$ ________________

b) (5 points) Find the **average velocity**, v_{av} of the object on the time interval $\left[\frac{\pi}{2}, \pi\right]$.

$v_{av} =$ ________________

c) (5 points) Find a formula for the **average velocity**, $v_{av}(t)$, on the time interval $[t, \pi]$ for $t < \pi$ and on the time interval $[\pi, t]$ for $t > \pi$. (Hint: the same formula works for both intervals.)

$v_{av}(t) =$ ________________

d) (5 points) Find the limit $\lim_{t \to \pi} v_{av}(t)$. (Hint: use part a)

$\lim_{t \to \pi} v_{av}(t) =$ ________________