Name .....

Section ☐ **01** Earl-8am ☐ **02** Yeung-9am ☐ **03** Furtado-10am ☐ **04** Li-11am
☐ **05** Furtado-11am ☐ **06** Zhong-12noon ☐ **07** Wiseman-1:10pm ☐ **08** Yeung-2:10pm

UNIVERSITY OF WYOMING — Math 2200 — Spring 2019 — Department of Mathematics

Calculus I

Common Exam II

5:15–7:00pm Thursday March 28, 2019

Instructions. Indicate your name and section/instructor above. You may use a scientific non-graphing calculator—no other aids are allowed. Cell phones and other devices must be turned off and left in your backpack/bag during the exam. **Write clearly**, using good mathematical notation and showing all required steps in the space provided. *Unless otherwise stated, justify your answers.* A list of useful formulas appears on the last page. Total value: 100 points.

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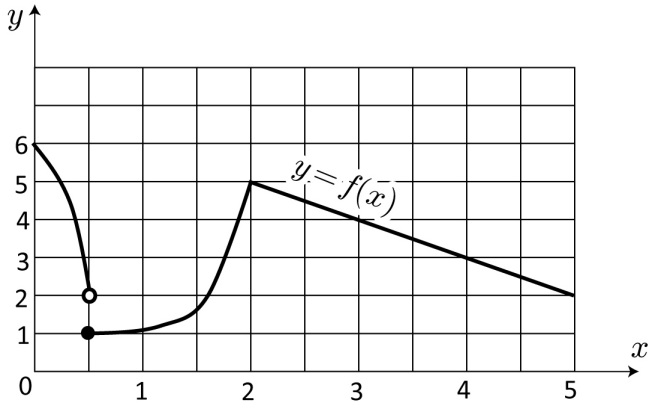
1. *(12 points)* Use the graph of $f(x)$ shown on the right to answer A,B,C,D. In parts A,B,C, write your answers in the blanks provided.



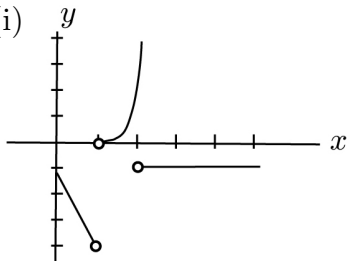
_____ A. Give the value(s) of x in the interval $(0, 5)$ at which at which $f(x)$ is not continuous.

_____ B. Give the value(s) of x in the interval $(0, 5)$ at which at which $f(x)$ is not differentiable.

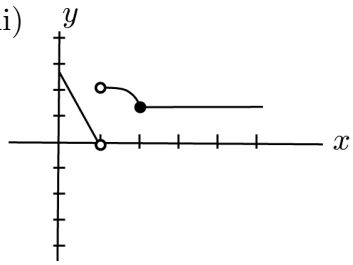
_____ C. What is the value of $f'(3)$?

D. Which of the following could be a graph of f'? Circle the correct answer.

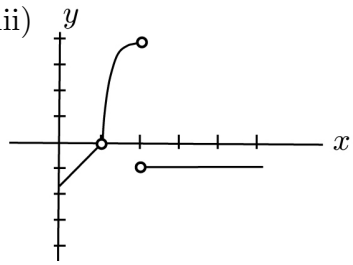
(i)



(ii)



(iii)



2. *(10 points)* The table below gives selected values of differentiable functions f, f', g, g'.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	-7	-1	2	17
1	15	14	11	2
2	3	4	4	7
3	13	5	8	3
4	-9	-3	-5	-4
5	-5	1	4	8

(a) If $h(x) = 2f(x) + 3g(x)$, determine $h'(2)$.

(b) If $u(x) = f(x)g(x)$, determine $u'(2)$.

(c) If $v(x) = \dfrac{f(x)}{g(x)}$, determine $v'(2)$.

(d) If $w(x) = g(f(x))$, determine $w'(2)$.

(e) If $r(x) = \big(f(x) - g(x)\big)^3$, determine $r'(2)$.

3. *(30 points)* In each case, find the required derivative. *Simplification is not required.*

(a) If $f(x) = x^4 + 6x^{5/2} - 3x^{-2}$ then
$f'(x) =$

(b) If $f(x) = \cos^5(x)$ then
$f'(x) =$

(c) If $g(t) = e^{t\sin(t)}$ then
$g'(t) =$

(d) If $H(x) = (3x + 1)\sqrt{x}$ then
$H'(x) =$

(e) If $G(x) = \dfrac{2x - 1}{(x + 4)^3}$ then
$G'(x) =$

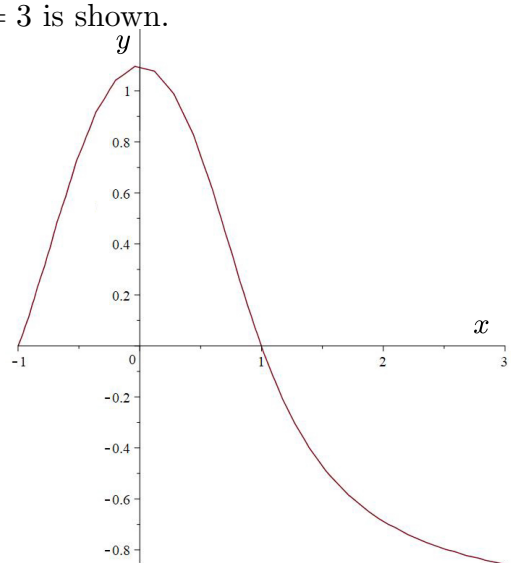
(f) $\dfrac{d}{dx} \sin^{-1}(3 - x) =$

4. *(10 points)* Let $f(x) = \ln(2x - 4)$. Find and *simplify*:

(a) $f'(x) =$

(b) $f''(x) =$

5. *(12 points)* A graph of the relation $e^y + 2(y+1)x^2 = 3$ is shown.



(a) Does the point $(1, 0)$ satisfy the relation?

(b) Find the slope of the tangent line to the graph at the point $(1, 0)$.

(c) Determine the equation of the tangent line to the graph at the point $(1, 0)$.

(d) In the graph given above, sketch and label the tangent line found in (c).

6. *(10 points)* A ball is thrown upwards and has height above the ground (in feet) given by

$$s(t) = -16t^2 + 160t$$

at time t (in seconds).

(a) Determine the velocity $v(t)$ of the ball at time t. What are the correct units of $v(t)$?

(b) Determine the acceleration $a(t)$ of the ball at time t. What are the correct units of $a(t)$?

(c) At what time(s) does the velocity of the ball equal zero?

(d) At what time(s) is the ball at ground level?

7. *(8 points)* The line $y = 3x - 5$ is tangent to the graph of a function $y = f(x)$ at the point $(2, 1)$. Determine the following values:

$f(2) =$

$f'(2) =$

8. *(8 points)* Determine the indicated derivatives *in simplified form*:

(a) $\dfrac{d}{dx}e^e =$

(b) $\dfrac{d}{dx}e^x =$

(c) $\dfrac{d}{dx}x^e =$

(d) $\dfrac{d}{dx}e^{ex} =$

(SCRATCH WORK)

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Useful Formulas

$f(u)$	$f'(u)$
$\tan u$	$\sec^2 u$
$\cot u$	$-\csc^2 u$
$\sec u$	$\sec u \tan u$
$\csc u$	$-\csc u \cot u$
$\ln f(u)$	$f'(u)/f(u)$
$\log_b u$	$1/(u \ln b)$
$\sin^{-1} u$	$1/\sqrt{1-u^2}$
$\tan^{-1} u$	$1/(1+u^2)$
$\sec^{-1} u$	$1/(\lvert u\rvert\sqrt{u^2-1})$
$\cos^{-1} u$	$-1/\sqrt{1-u^2}$
$\cot^{-1} u$	$-1/(1+u^2)$
$\csc^{-1} u$	$-1/(\lvert u\rvert\sqrt{u^2-1})$

Chain rule: $(f \circ g)'(x) = f'(g(x))g'(x)$

For instructors' use only:

Question	1	2	3abc	3def	4	5	6	7	8	Total
Points	12	10	15	15	10	12	10	8	8	100
Score										