Math 141, Exam 1
Practice Exam

Name: _____

Student ID: _____

Version: A

Instructions:

- Do NOT open exam booklet until instructed.
- Write your Name and Student ID Number on the lines above.
- Write your Name and Student ID Number on the answer sheet.
- Fill in version (A or B) on your answer sheet.
- No calculators, personal devices (phones, computers, tablets, etc.), or reference materials may be used during the exam.
- Indicate your answer to each question on the answer sheet by fully filling in the appropriate bubble.
- You may use any blank space on this exam booklet for your scratch work.
- The exam booklet and answer sheet will be collected at the end of the exam. Only the answer sheet will be graded.

Answer #1-3 for the function $f(x) = \begin{cases} x^2, & x \leq 2 \\ x+3, & x > 2 \end{cases}$.

1. Find $\lim_{x \to 2^-} f(x)$.

(a) 4

(b) 5

(c) 1

(d) the limit does not exist

2. Find $\lim_{x \to 2^+} f(x)$.

(a) 4

(b) 5

(c) 1

(d) the limit does not exist

3. Which of the following statements are true.

(a) $f(x)$ is undefined at 2.

(b) $f(x)$ is not continuous at 2.

(c) $f(x)$ is not differentiable at 2.

(d) all of the above.

(e) (b) and (c).

4. Evaluate $\lim_{x \to 0} \frac{x^2 - 3x}{x}$.

(a) 0

(b) ∞

(c) -3

(d) the limit does not exist

5. Evaluate $\lim_{x \to -1} \frac{1}{x+3}$.

(a) $\frac{1}{2}$

(b) $\frac{1}{4}$

(c) $\frac{1}{3}$

(d) the limit does not exist

In #6-8, suppose a car's distance s in miles from its starting point after t hours is given by $s(t) = 4t^2 + t$.

6. Find a formula for the average rate of change of distance with respect to time (average velocity) from time t to time $t + h$.

(a) $8t + 4h + 1$

(b) $8t + 4h$

(c) $8t + 1$

(d) $8t + 4h^2$

7. Find the average rate of change of distance with respect to time (average velocity) as t changes from 0 to 3.

(a) 13 miles/hour

(b) 12 miles/hour

(c) 1 miles/hour

(d) 36 miles/hour

8. Find the instantaneous rate of change of distance with respect to time (instantaneous velocity) at $t = 3$.

(a) 37 miles/hour

(b) 8 miles/hour

(c) 13 miles/hour

(d) 25 miles/hour

9. Which of the following is a formula for the difference quotient?

(a) $\frac{f(x+h)-f(x)}{(x+h)-h}$.

(b) $\frac{f(x+h)-f(x)}{x-(x+h)}$.

(c) $\lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$.

(d) $\lim_{h\to 0} \frac{f(x+h)-f(x)}{x-(x+h)}$.

Consider the function $f(x) = \frac{1}{x+2}$ when answering #9-12.

10. Find the simplified form of the difference quotient for the function $f(x) = \frac{1}{x+2}$.

(a) $\frac{-1}{(x+2)^2}$

(b) $\frac{-1}{(x+h+2)^2}$

(c) $\frac{-h}{(x+h+2)(x+2)}$

(d) $\frac{-1}{(x+h+2)(x+2)}$

11. Which of the following is the derivative of $f(x) = \frac{1}{x+2}$.

(a) $\frac{-1}{(x+h+2)^2}$

(b) $\lim_{x\to 0} \frac{-1}{(x+2)^2}$

(c) $\lim_{h\to 0} \frac{-h}{(x+h+2)(x+2)}$

(d) $\lim_{x\to 0} \frac{-1}{(x+h+2)(x+2)}$

(e) $\lim_{h\to 0} \frac{-1}{(x+h+2)(x+2)}$

12. What do your answers to #10 and #11 represent?

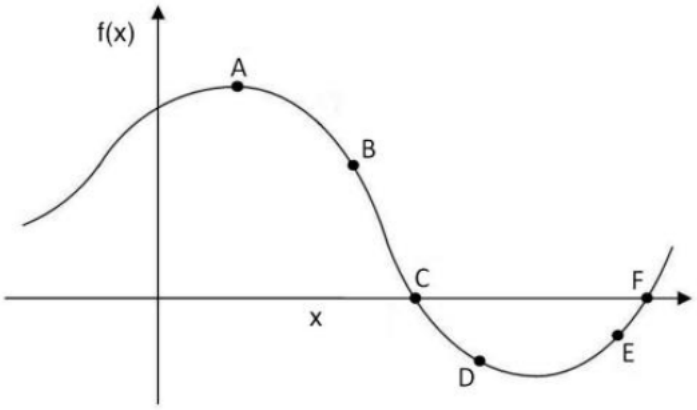
(a) average rates of change.

(b) instantaneous rates of change.

(c) the slopes secant lines and tangent lines respectively.

(d) the slopes of tangent lines and secant lines respectively.

Consider the function $f(x)$, which is graphed below, when answering #13 - 14.



13. Which of the following statements is true about the function at point B?

(a) f is positive f' is positive.

(b) f is positive f' is negative.

(c) f is negative f' is positive.

(d) f is negative f' is negative.

(e) None of the above statements are true.

14. Which of the following has the **largest** value?

(a) $f'(x)$ at point A

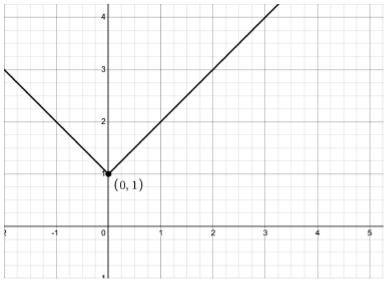
(b) $f'(x)$ at point B

(c) $f'(x)$ at point D

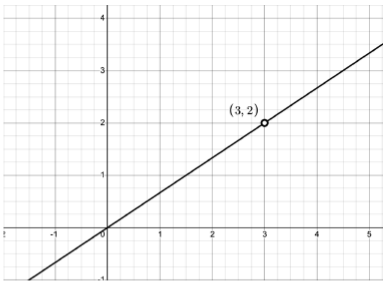
(d) $f'(x)$ at point E

(e) $f'(x)$ at point F

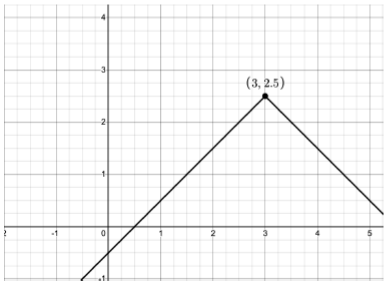
15. Which of the following functions are differentiable at $x = 3$?



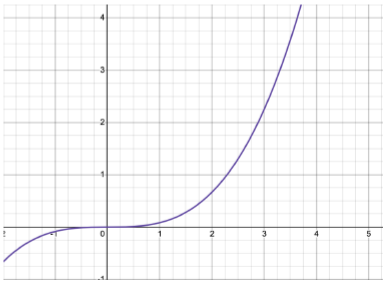
(1) $f(x) = |x| + 1$



(2) $g(x) = \frac{2}{3}x$ when $x \neq 3$



(3) $h(x) = -|x - 3| + 2.5$



(4) $j(x) = \frac{1}{12}x^3$

(a) $g(x)$ and $j(x)$

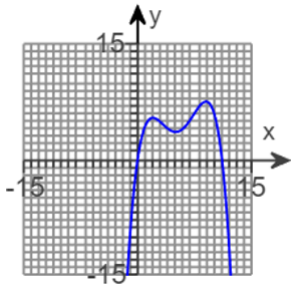
(b) $f(x)$ and $j(x)$

(c) $f(x)$, $h(x)$, and $j(x)$

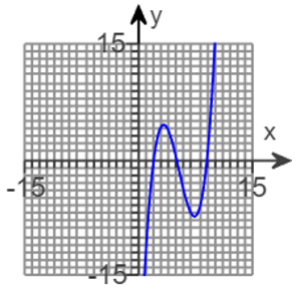
(d) all of these functions are differentiable at $x = 3$.

16. Which of the following the graphs matches the description of the function f?
$f'(x) > 0$ for $x \in (-\infty, 2) \cup (5, 9)$ and $f'(x) < 0$ for $x \in (2, 5) \cup (9, \infty)$.

(a)



(b)



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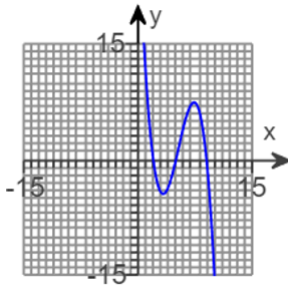
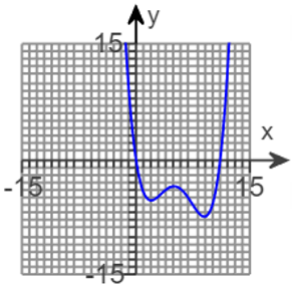


(d)



17. Find the derivative of the function $h(x) = (x^3 - 7x)^4$.

(a) $4(x^3 - 7x)^3$

(b) $4(x^3 - 7x)^3(3x^2)$

(c) $4(x^3 - 7x)^3(3x^2 - 7)$

(d) $4(x^3 - 7x)^3(3x^2 - 7x)$

18. Compute the slope of the tangent line to $g(x) = \frac{\sqrt{x}}{x^2+1}$ at $x = 1$.

(a) 1

(b) -1

(c) $\frac{1}{4}$

(d) $\frac{-1}{4}$

19. Let $y = (x + 1)(x^2 + 3x - 2)$. Find $\frac{dy}{dx}$.

(a) $(x^2 + 3x - 2) + (2x + 3)(x + 1)$

(b) $(x + 1)(x^2 + 3x - 2) + (2x + 3)(x + 1)$

(c) $(2x + 3)(x + 1) - (x^2 + 3x - 2)$

(d) $(x + 1)(2x - 2) + (x^2 + 3x - 2)$

20. Find y'' if $y = 5x^3 - x^5$.

(a) $6x - 20x^3$

(b) $15x^2 - 5x^4$

(c) $30x - 20x^3$

(d) $30 - 5x^3$