

Math 141 Exam 2 Fall 2019

Make sure you fill in your answers clearly on the scantron answer sheet provided. Fill in your name, student ID number, and exam version on the answer sheet. You may use this exam to work out the problems. You must hand in this exam as well as the scantron answer sheet. When you hand in your exam, be prepared to show your picture ID. No notes or formula sheets are allowed for this exam. Approved calculators such as TI-83 or TI-84 calculators are permitted for this exam, however TI-89 calculators and any CAS calculators are prohibited. No cell phones are permitted outside your bag at any time during the exam.

Name, and section: _____

ID#: _____

Exam version: B

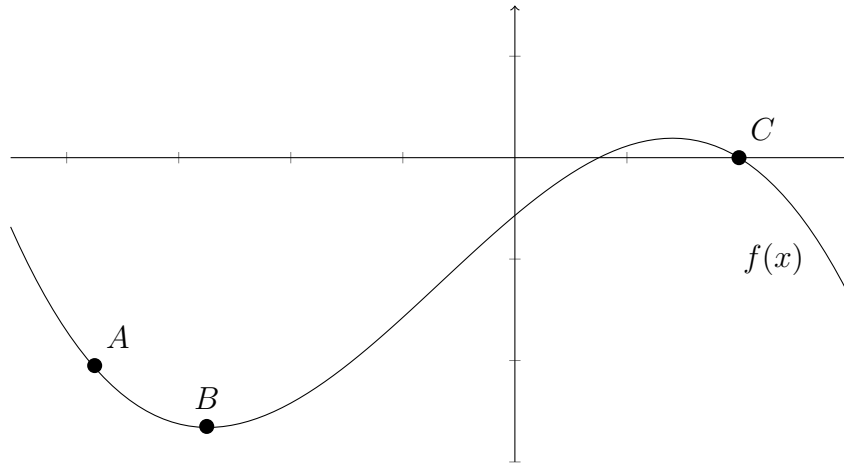


Figure 1: Use this graph to answer questions 1-3.

[1] Which of the following are true at point A ?

- A. $f(x)$ is negative, $f'(x)$ is negative, and $f''(x)$ is positive.
- B. $f(x)$ is negative, $f'(x)$ is positive, and $f''(x)$ is negative.
- C. $f(x)$ is negative, $f'(x)$ is negative, and $f''(x)$ is negative.
- D. $f(x)$ is negative, $f'(x)$ is positive, and $f''(x)$ is positive.

[2] Which of the following are true at point B ?

- A. $f(x)$ is zero, $f'(x)$ is positive, and $f''(x)$ is negative.
- B. $f(x)$ is negative, $f'(x)$ is positive, and $f''(x)$ is zero.
- C. $f(x)$ is negative, $f'(x)$ is zero, and $f''(x)$ is negative.
- D. $f(x)$ is negative, $f'(x)$ is zero, and $f''(x)$ is positive.

[3] Which of the following are true at point C ?

- A. $f(x)$ is zero, $f'(x)$ is positive, and $f''(x)$ is negative.
- B. $f(x)$ is zero, $f'(x)$ is positive, and $f''(x)$ is positive.
- C. $f(x)$ is zero, $f'(x)$ is negative, and $f''(x)$ is negative.
- D. $f(x)$ is zero, $f'(x)$ is negative, and $f''(x)$ is positive.

[4] If $f(x) = \frac{1}{1+x}$, find $f^{(3)}(x)$.

A. $\frac{-6}{(1+x)^4}$

B. $\frac{6}{(1+x)^4}$

C. $\frac{-2}{(1+x)^3}$

D. $\frac{2}{(1+x)^3}$

[5] Find all critical values of $f(x) = \sqrt[3]{x^2 - 8x}$.

A. $x = 0$ and $x = 8$

B. $x = 0$, $x = 4$, and $x = 8$

C. $x = 0$ and $x = 4$

D. $x = 4$ only

[6] On which interval(s) is $f(x) = -\frac{1}{12}x^4 + \frac{1}{3}x^3 + \frac{3}{2}x^2$ concave up?

A. $(-1, 3)$

B. $(-\infty, -1)$ and $(3, \infty)$

C. $(-\infty, \infty)$

D. $f(x)$ is never concave up

[7] Find all inflection points of $f(x) = x^4 - 4x^3$.

A. $x = 0$ only

B. $x = 0$ and $x = 2$

C. $x = 0$ and $x = 3$

D. $x = 0$, $x = 2$, and $x = 3$

- [8] Find the horizontal asymptote of $f(x) = \frac{7x^2}{5x^3 + x}$, if it exists.
- A. $y = 0$
 - B. $y = \frac{2}{3}$
 - C. $y = \frac{7}{5}$
 - D. f does not have a horizontal asymptote.
- [9] If $f(-1) = -3$, $f'(-1) = 0$, and $f''(-1) = 5$, then
- A. there is a relative maximum at $x = -1$
 - B. there is a relative minimum at $x = -1$
 - C. there is an inflection point at $x = -1$
 - D. $f(-1)$ is the absolute maximum value
- [10] Which of the following is true?
- A. If $(c, f(c))$ is an inflection point, then $f''(c) = 0$
 - B. If $(c, f(c))$ is a relative maximum point, then c is a critical value for f .
 - C. If $(c, f(c))$ is a relative maximum point, then $f''(c) = 0$
 - D. None of the above
- [11] What is the absolute maximum value of $f(x) = x^4 - x^3$ on $[-1, 1]$?
- A. $\frac{27}{256}$
 - B. $\frac{3}{4}$
 - C. 2
 - D. 0
- [12] Find the absolute maximum and minimum values of $f(x) = \frac{5x}{x^2 + 1}$ on the interval $[0, 2]$.
- A. The absolute minimum value is 0, and the absolute maximum value is 2.
 - B. The absolute minimum value is $-\frac{5}{2}$, and the absolute maximum value is $\frac{5}{2}$.
 - C. The absolute minimum value is 0, and the absolute maximum value is $\frac{5}{2}$.
 - D. The absolute minimum value is 0, but there is no absolute maximum value.

[13] If the revenue function is $R(x) = 50x - 0.5x^2$ and the cost function is $C(x) = 4x + 10$, which of the following is the profit function?

A. $P(x) = -0.5x^2 + 46x + 10$

B. $P(x) = -0.5x^2 + 46x - 10$

C. $P(x) = 0.5x^2 - 46x + 10$

D. $P(x) = -0.5x^2 - 46x + 10$

Use the function $P(x)$ from problem 13 to answer questions 14-16.

[14] Which of the following is the best interpretation of $P(20)$?

A. $P(20)$ is the approximate profit from producing and selling the 20th unit.

B. $P(20)$ is the exact profit from producing and selling the 20th unit.

C. $P(20)$ is the approximate profit from producing and selling the first 20 units.

D. $P(20)$ is the exact profit from producing and selling the first 20 units.

[15] Which of the following is the best interpretation of $P'(20)$?

A. $P'(20)$ is the approximate profit from producing and selling the 21st unit.

B. $P'(20)$ is the exact profit from producing and selling the first 21 units.

C. $P'(20)$ is the approximate profit from producing and selling the 20th unit.

D. $P'(20)$ is the exact profit from producing and selling the first 20 units.

[16] Which of the following would be used to approximate the profit from producing and selling the first 21 items?

A. $P'(20)$

B. $P'(21)$

C. $P(20) + P(1)$

D. $P(20) + P'(20)$

[17] If the difference of two real numbers is 16, what is the minimum possible value of their product?

- A. 16
- B. 0
- C. -64
- D. 64

[18] Tom is going to build a rectangular enclosure on the side of his house. One side of the enclosure will be the wall of his house, while the other three sides will be made of fencing. If Tom has 60 feet of fencing available to make his enclosure, what are the dimensions that will maximize the area enclosed?

- A. 25 feet \times 10 feet
- B. 20 feet \times 20 feet
- C. 15 feet \times 30 feet
- D. 10 feet \times 50 feet

[19] Suppose that for a given function f , both f' and f'' exist everywhere on the interval $(-\infty, \infty)$ and that f has exactly one critical value, which is at $x = 3$. If $f'(3) = 0$ and $f''(3) = 5$, which of the following are necessarily true?

- A. f has a relative minimum at $x = 3$.
- B. f has a relative maximum at $x = 3$.
- C. f has an inflection point at $x = 3$.
- D. None of the above.

[20] Sarah's Suit Store determines that in order to sell x suits, the price per suit should be given by $p = 150 - 0.5x$. The cost of producing x suits is given by $C(x) = 4000 + 0.25x^2$. What price per suit should be charged in order to maximize the profit?

- A. \$200
- B. \$150
- C. \$100
- D. None of the above.