

Math 112 (Calculus I)

Final Exam Part I Form B

Multiple Choice. Fill in the answer to each problem on your scantron. Make sure your name, section and instructor is on your scantron.

1. Given the function

$$f(x) = \begin{cases} 1 - 2x - x^2 & x \leq 1 \\ 2x - 3 & x > 1 \end{cases},$$

what is $\lim_{x \rightarrow 1^-} f(x)$ and $\lim_{x \rightarrow 1^+} f(x)$ respectively?

- a) -3,-3 b) -2,-2 c) -1, -1
d) -3,-2 e) -2,-3 f) -2,-1
g) -1,-2

Solution: f)

2. What is $\lim_{x \rightarrow 0} (x^2 + 1) \tan x$?

- a) 0 b) 1
c) ∞ d) Undefined because $(x^2 + 1) \tan x$ has a vertical asymptote at 0.
e) Undefined because the left and right hand limits about 0 differ.

Solution: a)

3. Find $\lim_{x \rightarrow 4} \frac{5}{\sqrt[3]{x^2 + 9}}$.

- a) 0 b) 1 c) $5^{-1/3}$
d) $5^{-1/2}$ e) $5^{1/3}$ f) $5^{1/2}$
g) 5 h) ∞ i) Undefined

Solution: e)

4. Find

$$\lim_{x \rightarrow \infty} \frac{5 - 3x^3}{\sqrt{81x^6 - 16}}$$

- | | | |
|-------------------|-------------------|---------|
| a) Does not exist | b) $-\infty$ | c) -3 |
| d) -1 | e) $-\frac{1}{3}$ | f) 0 |
| g) $\frac{1}{3}$ | h) 1 | i) 3 |

Solution: e)

5. What is the average rate of change of a function over an interval?

- a) The difference in the value of the function at the endpoints of the interval.
- b) The difference of the ratio of the value of the function at the endpoints to the value of the endpoints.
- c) The ratio of the difference of the values of the function at the endpoints to the difference of the endpoints.
- d) The ratio of the value of the function to the value of x .
- e) None of the above.

Solution: c)

6. If $u(t) = t^2 + t^{1/2}$, what is $u'(4)$?

- | | | |
|-------------------|-------------------|-------------------|
| a) 14 | b) 18 | c) $\frac{15}{4}$ |
| d) $\frac{17}{4}$ | e) $\frac{31}{4}$ | f) $\frac{33}{4}$ |

Solution: f)

7. If $f(x) = \frac{x^2}{2x + 1}$, what is $f'(2)$?

- | | | |
|--------|--------------------|--------------------|
| a) 0 | b) $\frac{12}{25}$ | c) $\frac{4}{5}$ |
| d) 1 | e) $\frac{5}{4}$ | f) $\frac{25}{12}$ |
- g) Undefined.

Solution: b)

8. If $f(x) = x^2 \tan x$, what is $f'(\pi/4)$?

a) 0

b) $\frac{\pi}{2}(1 + \frac{\pi}{4})$

c) $\pi(1 + \frac{\pi}{8})$

d) $\frac{\pi}{2}(1 + \frac{\sqrt{2}}{8}\pi)$

e) None of the above.

Solution: b)

9. Find the derivative to $h(x) = (\sqrt{x})^x$, where it exists.

a) \sqrt{x}^{x-1}

b) $x\sqrt{x}^{x-1}$

c) $\ln(\sqrt{x})\sqrt{x}^x$

d) $\ln(\sqrt{x})\sqrt{x}^{x-1}$

e) $(\ln(\sqrt{x}) + \frac{1}{2})\sqrt{x}^x$

Solution: e)

10. A bacteria population increases from 1000 to 1200 in 2 hours. What is the time it takes for the bacteria population to double?

a) $\frac{2 \ln(2)}{\ln(6/5)}$

b) $\frac{\ln(2)}{2 \ln(6/5)}$

c) $\frac{2 \ln(6/5)}{\ln(2)}$

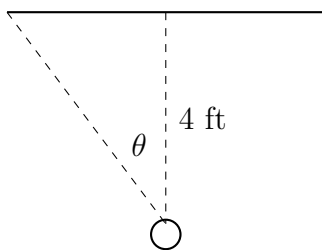
d) $\frac{\ln(6/5)}{2 \ln(2)}$

e) 10 hours

f) There is not enough information

Solution: a)

11. A camera is positioned 4 feet to the side of a straight road in order to track cars. Let the closest point to the camera on the road be called X. If a car travels down the road at 60 feet per second, how fast is the angle of the camera changing when the angle of the camera (away from X) is $\pi/6$ radians?



a) 15 radians per second.

b) 20 radians per second.

c) $\frac{45}{4}$ radians per second.

d) $\frac{15}{4}$ radians per second.

e) 30 radians per second.

f) 60 radians per second.

Solution: c)

12. Use linear approximation or differentials to estimate $\sqrt[3]{1000.03}$.

- a) 10
- b) 10.1
- c) 10.01
- d) 10.001
- e) 10.0001
- f) None of the above.

Solution: e)

13. Let $r(x) = x^3 - 3x + 2$ be defined on the interval $0 \leq x < 2$. Find all absolute maximums and minimum values of r on this interval. (In the list below, the minimum is listed first and the maximum second. None means that there is no minimum or maximum, depending on its position).

- a) None, None
- b) 0, None
- c) 2, None
- d) 0, 2
- e) 0, 4
- f) None, 2
- g) None 4

Solution: e)

14. Let $k(x) = \sqrt{x-1}$. For what value of c does $k(x)$ satisfy the Mean Value theorem on the interval $[1, 5]$? (In other words, what value of c satisfies $k'(c) = \frac{k(5) - k(1)}{5 - 1}$?)

- a) 1
- b) 2
- c) 3
- d) 4
- e) 5
- f) 6

Solution: b)

15. If $f'(x)$ is decreasing and positive, what can you say about f ? f is

- a) positive and concave up
- b) negative and concave up
- c) positive and concave down
- d) negative and concave down
- e) increasing and concave up
- f) decreasing and concave up
- g) increasing and concave down
- h) decreasing and concave down

Solution: g)

16. Find $\lim_{x \rightarrow 0} \frac{e^x - 1}{\sin(2x)}$

- a) $\frac{1}{4}$
- b) $\frac{1}{2}$
- c) 1
- d) 2
- e) e
- f) None of the above.

Solution: b)

17. Find an antiderivative of $f(x) = 3x^2 + \frac{2}{x^2}$.

a) $x^3 + \frac{1}{x}$

b) $x^2 + \frac{2}{x^2}$

c) $x^3 - \frac{4}{x^3}$

d) $x^3 + \frac{4}{x^3}$

e) $x^3 - \frac{2}{x}$

f) $x^3 + \frac{2}{x}$

Solution: e)

18. Find $\int_1^3 2x + 1 \, dx$

a) 6

b) 10

c) 12

d) 16

e) 24

Solution: b)

19. If $\int_0^6 f(x) \, dx = 5$ and $\int_4^6 f(x) \, dx = 7$, what is $\int_0^4 f(x) \, dx$?

a) -2

b) 0

c) 2

d) 5

e) There is not enough information

f) No such function exists.

Solution: a)

20. If $f(x) = \int_1^{2x} \sqrt{1+2t} \, dt$, what is $f'(2)$?

a) $\sqrt{5}$

b) 2

c) $\sqrt{8}$

d) 3

e) $\sqrt{12}$

f) 6

Solution: f)