

Math 112 (Calculus I)

Final Exam Part I Form B

Instructions:

- Fill out the scantron carefully. Your name must be written in both places, and the bubbles correctly filled in. Your net id or byu id must be filled in with the appropriate bubbles filled in. Your scantron must have the correct form (A or B) listed on it. If the scantron is not filled out correctly, you will receive *no* credit for this section of the exam.
- You may write on the exam - however, the exam will only be graded by your responses on the scantron.
- Calculators are not allowed.

Do not open until you are told to begin

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

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.

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

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

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.

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) $\frac{33}{4}$

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.

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.

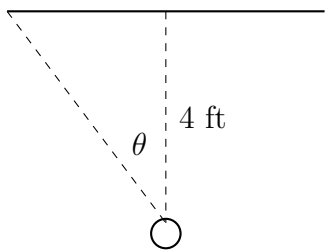
9. Find the derivative to $h(x) = (\sqrt{x})^x$, where it exists.

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

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

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.

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.

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

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

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

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.

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

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

- a) 6 b) 10 c) 12
d) 16 e) 24

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.

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