

University of Toronto Mississauga
Mathematical and Computational Sciences
MAT133Y5Y
Calculus Readiness Assessment
Duration - 100 minutes
No Aids Permitted

This exam consists of 9 pages including the cover page, and contains 35 questions. Questions are printed on both sides of each sheet of paper, so be sure to check the back of each page. Each question includes five multiple choice answers, of which only a single response is correct. All answers should be indicated the included scantron sheet. When filling out the scantron:

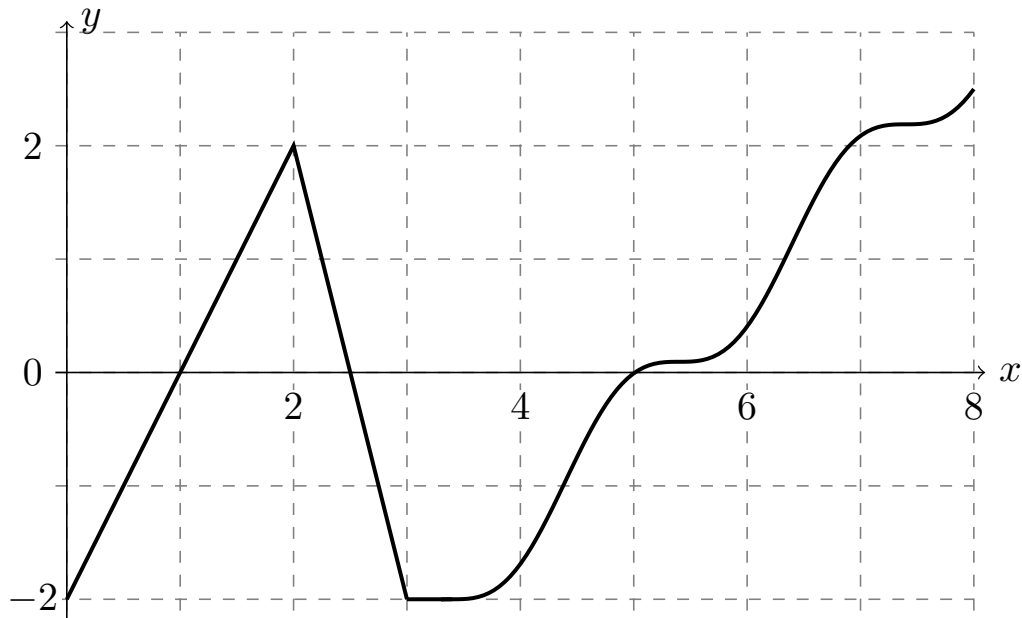
- Use a #2 pencil to bubble answers (do not use ink).
- Ensure that circles are completely filled and make complete erasures.
- Fill in your name in the top right corner. Be sure to fill out your student number using the bubble sheet. Students who fail to include their student number will receive a **zero** on the exam.
- You will **not** be penalized for incorrect answers.

You will be provided with blank sheets of paper for rough work. If you run out of sheets, raise your hand and an invigilator will bring you more. At the end of the examination, you will only submit your scantron sheet – We do not need your scrap paper, nor this examination booklet.

You will **not** be permitted extra time at the end of the exam to fill in the scantron sheet. It is therefore essential to ensure you have filled in the scantron sheet prior to the end of the examination.

No aids are permitted on this examination. Examples of illegal aids include, but are not limited to textbooks, notes, calculators, or any electronic device.

The following is the graph of a function f with domain $[0, 8]$. It is to be used for Question 31 - 35. As you will not be handing this booklet in, you are allowed to tear this page off.



There are 35 multiple choice questions, each with five options. In each question, **only a single option is correct**. Use the scantron sheet provided to indicate your solution. This exam booklet will not be marked.

1. Which equation describes the line passing through the points $(1, 5)$ and $(7, 3)$.

A. $2y + 3x = 4$

B. $x + 3y + 14 = 0$

C. $y = 16x - 3$

D. $3y + x = 16$

E. $y = x/3 - 16$

2. Suppose f is an invertible function, such that

$$f(0) = 4, \quad f(1/2) = 0, \quad f(3) = 6.$$

What is the value of $f^{-1}(0)$?

A. $1/2$

B. 6

C. 0

D. 4

E. Not enough information has been provided.

3. Which of the following is equivalent to $\log_2(4^{32})$?

A. 64

B. 32

C. 0

D. 961

E. 16

4. Consider the lines $L_1 : x + 4y = -1$, $L_2 : y + 4x = -2$, and $L_3 : y - 4x = 6$. Which pair of lines are perpendicular to one another?

A. L_1 and L_2

B. L_1 and L_3

C. L_2 and L_3

D. All three lines are simultaneously perpendicular.

E. No three lines are perpendicular.

5. Let r_1 and r_2 be the roots of the polynomial $p(x) = 3x^2 - 30x + 27$. What is $r_1 \times r_2$?

A. 2

B. 9

C. 27

D. 81

E. The polynomial p has only one root.

6. Which expression is equivalent to $(x - 2)^3$?
- A. $x^3 - 8$
 - B. $x^2 - 4x - 4$
 - C. $x^3 - 6x^2 + 12x - 8$**
 - D. $x^3 - 8x^2 + 16x - 4$
 - E. $8x^3 - 16x^2 + x + 8$
7. Suppose p is a polynomial of degree 4 and q is a polynomial of degree 6. If $r = p \circ q$, then what is the degree of r ?
- A. 2
 - B. 10
 - C. 14
 - D. 20
 - E. 24**
8. On which of the following sets is $2x^2 - 16x + 24 > 0$?
- A. $[4, 12]$
 - B. $(0, 6)$
 - C. $(-\infty, 2) \cup (6, \infty)$**
 - D. $(-\infty, 8) \cup (12, \infty)$
 - E. $(-\infty, 4) \cup (12, \infty)$
9. If $|x| < 8$, which of the following statements must be true?
- A. $x^2 > 8$
 - B. $x^2 < 8$
 - C. $x > 8$
 - D. $x < 8$**
 - E. None of the above statements are correct.
10. Which expression is equivalent to $e^{12\ln(20)+\ln(13)}$?
- A. 0
 - B. $12^{20} + 13$
 - C. $12\ln(20) + \ln(13)$
 - D. $(12^{20})(13)$
 - E. $(20^{12})(13)$**

11. Which of the following statements describes the function $f(x) = \sqrt{x^3 - 64}$?
- A. f is even
 - B. f is odd
 - C. f is both even and odd
 - D. f is neither even nor odd**
 - E. None of the above statements are correct.
12. If $f(x) = 2x^2$ and $g(x) = x + 4$, determine $f(g(-2)) - g(f(-2))$.
- A. -68
 - B. -4**
 - C. 0
 - D. 28
 - E. None of the above answers
13. What is the largest possible domain for the function $f(x) = \ln(e^{4x} + 2x^2)$?
- A. \mathbb{R}**
 - B. $[0, \infty)$
 - C. $(-2, 2)$
 - D. $(0, \infty)$
 - E. None of the above answers
14. The equation $\log_x(20x - 51) = 2$ has two solutions s_1 and s_2 . Determine $s_1 + s_2$.
- A. 9
 - B. 20**
 - C. 102
 - D. 289
 - E. None of the above answers
15. Which of the following expressions is equivalent to $\ln(e^{2x}e^{3y})$?
- A. $6xy$
 - B. $5(x + y)$
 - C. $2x + 3y$**
 - D. $\ln(e^{2x})\ln(e^{3y})$
 - E. None of the above answers

16. Determine the value of $\log_{3^5}(3^{50})$.
- A. 10
 - B. 18
 - C. 30
 - D. 50
 - E. None of the given answers
17. The expression $e^{\ln(22)} - \ln(e^{22})$ simplifies to which of the following expressions?
- A. -4
 - B. $2\ln(2)$
 - C. e^{22}
 - D. The expression is not well-defined.
 - E. None of the above answers.**
18. What values of x satisfy $|5x - 9| < 6$?
- A. $3 < x < 15$
 - B. $3/5 < x < 3$**
 - C. $-1/9 < x < 11/9$
 - D. All real numbers
 - E. None of the above answers
19. Suppose $f(x) = \frac{x^2 - 16x + 63}{x - 7}$. Which of the following statement is correct?
- A. $f(x) = x - 9$ for all $x > 0$
 - B. $f(x) = x - 7$ for all $x < 0$
 - C. $f(x) = 0$ when $x = 7$
 - D. $f(x) = x - 9$ for all $x > 10$**
 - E. None of the above answers.
20. Suppose f and g are functions, with particular values described by

x	-1	1	2	10
$f(x)$	8	2	7	10
$g(x)$	-9	10	2	9

Determine the value of $f(f(1))g(g(1))$.

- A. -72
- B. 14
- C. 63**
- D. 90
- E. None of the above answers.

21. Which expression is equivalent to $(12x^3 + 13x)^4 x^{-3}$?

- A. $(12x^2 + 13x)x^7$
- B. $12x^3 + 13x$
- C. $(12 + 13/x^2)^4$
- D. $x(12x^2 + 13)^4$**
- E. None of the above answers

22. Which expression is equivalent to 7^{6^9-54} ?

- A. $(7^{6^8}/7^9)^6$**
- B. $7^{54}/7^9$
- C. $7^{54} - 7^9$
- D. $7^{6^9} - 7^{54}$
- E. None of the above answers.

23. Suppose $f(x) = 6\sqrt{49x^2}$. What is the value of $f(-4)$?

- A. -168
- B. 28
- C. 168**
- D. 1176
- E. 2446

24. Suppose $p(x) = ax^2 + bx + c$ is a quadratic polynomial with two roots, $-r$ and r for some $r \neq 0$. Which statement is true about b ?

- A. $b = 0$**
- B. $b > 0$
- C. $b < 0$
- D. $b > r^2$
- E. None of the above answers.

25. Find all solutions to $(3x + 24)^2 = 81$.

- A. $x = -11$ and $x = -5$**
- B. $x = \pm 11$
- C. $x = 0, -5$
- D. $x = \pm 5$
- E. $x = -5$ and $x = 11$

26. Suppose $f(x) = \frac{x+2}{2x-1}$. What is $f^{-1}(3)$?
- A. -1
 - B. 1**
 - C. 3
 - D. 5
 - E. 7
27. Where does the function $f(x) = 3x^2 - 30x - 77$ achieve its global minimum?
- A. $x = 0$
 - B. $x = 3/2$
 - C. $x = 4$
 - D. $x = 5$**
 - E. $x = 7/2$
28. Which of the following statements is **false**?
- A. $\sqrt{xy} = \sqrt{x}\sqrt{y}$ for $x, y > 0$.
 - B. $\ln(x^y) = y \ln(x)$ for $x, y > 0$.
 - C. $e^{xy} = (e^x)^y$ for all $x, y \in \mathbb{R}$.
 - D. $x/y = 1/(y/x)$ for all $x, y \neq 0$.
 - E. $\ln(x+y) = \ln(x) + \ln(y)$ for all $x, y > 0$.**
29. For which of the following functions is it true that $f(x) = f(y)$ implies that $x = y$?
- A. $f(x) = e^{2x}$**
 - B. $f(x) = 3x^2 - 4$
 - C. $f(x) = |x|$
 - D. $f(x) = x^4 - x^2$
 - E. $f(x) = (x^2 + 1)^{-1}$
30. What is the range of the function $f(x) = \frac{1}{x^2 + 1}$?
- A. \mathbb{R}
 - B. $(-\infty, -1) \cup (-1, \infty)$
 - C. $(-\infty, 0) \cup (0, \infty)$
 - D. $(0, 1]$**
 - E. $(0, \infty)$

For Questions 31-35, let f be the function with domain $[0, 8]$ graphed on the second page. You will not be handing in this booklet, so **you may tear the front page off**.

31. For which of the following values of x is it true that $f(f(x)) = x$?

- A. $x = 0$
- B. $x = 2$**
- C. $x = 4$
- D. $x = 6$
- E. None of the values satisfy the equation.

32. What are the roots of f ?

- A. $x = -2$ and $x = 2$
- B. $x = 3$, $x = 5$, and $x = 7$
- C. $x = 1$, $x = 2.5$, and $x = 5$**
- D. $x = 2$ and $x = 8$
- E. The function has no roots.

33. Suppose $g(x) = f(x - r)$ for some $r > 0$. What is the domain of g ?

- A. $[0, 8]$
- B. $[-r, r]$
- C. $[-r, 8 - r]$
- D. $[r, 8 + r]$**
- E. None of the above answers.

34. Suppose $h(x) = 2f(x - 1) - 1$. What is $h(h(3))$?

- A. 0
- B. 1
- C. 2
- D. 3**
- E. None of the above answers.

35. Suppose $s(x) = 4f(x)$. Which of the following statements is true?

- A. The range of s and the range of f are the same.
- B. The domain of s is $[0, 2]$.
- C. $s(x) > f(x)$ for all $x \in [0, 8]$.
- D. $s(s(2)) = s(2)$
- E. The roots of f and the roots of s are the same**