

TMATYC - Calculus A Test – 2012

Instructions for the Answer Sheet

DO NOT BEGIN UNTIL YOU ARE TOLD TO DO SO

To the student:

Complete **all** information on answer sheet. Carefully answer the eligibility questions. You will be disqualified if you take an incorrect test. If you are unsure of your eligibility status, ask your test monitor **NOW**, before starting the test. No questions may be asked once the test begins.

You have one hour to take this test. You are allowed to use a non-symbolic calculator (such as the TI-83, TI-84, or TI-86). Calculators that perform symbolic manipulations are **not** allowed (these include the TI-89, TI-92, or TI-Nspire). Blank scratch paper is allowed. No books, notes, or any other electronic devices are allowed. Please refrain from using any cell phone during the test. Such devices should be muted or put on silent mode.

There are 25 questions on the test. Each question is worth 4 points for a correct answer, but 1 point will be subtracted for each incorrect answer. There is no penalty for unanswered questions.

You are not expected to answer every question in the time allowed. If you are having difficulty with a question, skip it and, if time permits, return to it after you finish the others.

Place the letter for your choice of the correct response on the answer sheet under the column entitled "Student's Response". **Write your letters in block capital form (i.e. write as A, B, C, or D).**

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Answer Sheet

Name: _____ School: _____

Address: _____

Current Math Class: _____

Math Teacher: _____

	Student's Response	Scorer
1		
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Email: _____

Phone: _____

Have you received a two-year or higher college degree? Yes No

Have you ever been enrolled in MATH 1920 (Calculus II) or any higher-level math class?

Yes No

For Scorer:

Number Correct = _____

Number Incorrect = _____

Number Blank = _____

Num Correct \times 4 = _____

– Num Incorrect = _____

Score on Test = _____

TMATYC
Calculus A Test Fall 2012

1. State the domain of $F(x) = x + \sqrt{2 - 4x}$.
A. $(-\infty, \infty)$ B. $[-\frac{1}{2}, \infty)$ C. $(-\infty, \frac{1}{2}]$ D. $(-\infty, -\frac{1}{2}]$

2. Differentiate $F(x) = \tan x \ln(3x)$.
A. $\frac{1}{\cos x} \left[\frac{\sin x}{x} + \frac{\ln(3x)}{\cos x} \right]$ B. $\left[\frac{\tan x}{3x} + 3 \ln(3x) \sec^2 x \right]$
C. $\left[\frac{\tan x}{3} + \ln(3x) \sec^2 x \right]$ D. $\left[\frac{\sec^2}{3x} + \sin x \ln(3x) \right]$

3. Find the critical numbers for $f(x) = x^3 - \frac{3}{2}x^2 - 18x + 5 = 0$.
A. -2, -3 B. 0, -3 C. -2, 3 D. -2, 0

4. The derivative of the function $f(x) = \frac{e^{2x}}{\sin x}$ is:
A. $e^{2x} \left(\frac{2}{\sin x} - \cot x \csc x \right)$ B. $\left(\frac{2}{\sin x} - \tan x \csc x \right)$
C. $2e^{2x} (\sec x - \tan x \sin x)$ D. $e^{2x} \left(\frac{2}{\sec x} - \cot x \sin x \right)$

5. How many points of inflection are on the graph of $f(x) = 4x^3 + 16x^2 - 6x - 7$?
A. 2 B. 0 C. 1 D. 3

6. Find $\frac{d}{dx} \int_x^0 \frac{dt}{t-2}$.
A. $\frac{1}{x-2}$ B. $\ln(t-2)$ C. $-\frac{1}{x-2}$ D. $\ln(x-2) + C$

7. Find $\lim_{x \rightarrow 0} \frac{e^x - 1 - x}{x^2}$.

- A. e B. $\frac{1}{2}$ C. 0 D. $-e$

8. If $f(x) = e^x g(x)$ where $g(0) = 2$, $g'(0) = 5$, find $f'(0)$.

- A. 7 B. $\frac{2}{5}$ C. e^7 D. $\frac{1}{7}$

9. Find the 28th derivative of $f(x) = \cos x$.

- A. $-\sin x$ B. $\cos x$ C. $-\cos x$ D. $\sin x$

10. Given the function $f(x) = \frac{x^2 - 2x - 16}{x - 2}$. What are asymptotes?

- | | |
|---|---|
| A. No vertical asymptote
Horizontal Asymptote $y = 2$
Oblique Asymptote $y = 2$ | B. Vertical Asymptote $x = 2$
No Horizontal Asymptote
Oblique Asymptote $y = x$ |
| C. Vertical Asymptote $x = 2$
Horizontal Asymptote $x = 2$
No Oblique Asymptote | D. Vertical Asymptote $x = 2$
No Horizontal Asymptote
No Oblique Asymptote |

11. Find the location of the absolute maximum of $f(x) = (x + 1)^2 (x - 2)$ on the interval $[-2, 1]$.

- A. -2 B. 0 C. -1 D. 1

12. If $f(x) = \int_1^{x^2 - \sin x} \frac{1}{t} dt$, find $f'(x)$.

- | | |
|-----------------------------|---------------------------------------|
| A. $\ln x^2 - \sin x $ | B. $\frac{2x - \cos x}{x^2 - \sin x}$ |
| C. $\frac{1}{x^2 - \sin x}$ | D. $\ln x^2 - \sin x (2x - \cos x)$ |

13. If $y = \frac{e^x}{\ln x}$, find $\frac{dy}{dx}$.

A. $\frac{xe^x - e^x \ln x}{x(\ln x)^2}$

B. $\frac{xe^x \ln x - e^x}{x(\ln x)^2}$

C. $\frac{e^x - e^x \ln x}{(\ln x)^2}$

D. $\frac{e^x - \ln x - e^x}{(\ln x)^2}$

14. Find $\int \frac{1}{x\sqrt{\ln x}} dx$.

A. $2(\ln x)^{1/2} + C$

B. $\frac{2}{\ln x} + C$

C. $2(\ln x)^{-1/2} + C$

D. $2 \ln x$

15. Find $\frac{dy}{dx}$ if $y = 3x^{3x}$

A. $(9x)x^{3x-1}$

B. $3(\ln x)x^{3x}$

C. $3x^{3x}(\ln x + x^{3x})$

D. $3x^{3x}(3 \ln x + 3)$

16. Let $f(x) = ax^3 + bx + 10$. If the equation of the line tangent to f at $x = -2$ is $y = 15x + 26$, then $a + b =$

A. 4

B. 5

C. 6

D. 7

17. If $g(x) = \begin{cases} 3x - 5 & \text{if } x \leq 4 \\ 15 - x^2 & \text{if } x > 4 \end{cases}$ then $\lim_{x \rightarrow 4^+} g(x) =$

A. -1

B. 0

C. 7

D. DNE

18. Find $\int_0^{\infty} \frac{1}{\sqrt{2\pi}} xe^{-x^2} dx$

A. 0

B. $\frac{1}{2\pi}$

C. $\frac{1}{2\sqrt{2\pi}}$

D. 1

19. Rewrite $10 \cosh(\ln x)$ in terms of exponentials.

- A. $\frac{5x^2+5}{x}$ B. 0 C. $5e^x + 5e^{-x}$ D. $5x$

20. Evaluate the definite integral $\int_{-\pi/4}^{\pi/4} (x^3 + x^4 \tan x) dx$

- A. 2 B. 0 C. 4 D. $\pi(\pi^2 + \pi^4)$

21. If f is continuous and $\int_0^4 f(x) dx = 10$, find $\int_0^2 f(2x) dx$.

- A. 10 B. 20 C. 5 D. 4

22. Find the area enclosed by the line $y = x - 1$ and the parabola $y^2 = 2x + 6$.

- A. 24 B. 9 C. 36 D. 18

23. If $y^5 - 2xy + x^3 = 4$ then $\frac{dy}{dx} =$

- A. $5y^4 - 2y + 3x^2$ B. $\frac{2y - 3x^2}{5y^4 - 2x}$ C. $\frac{-3x^2}{5y^4 - 2}$ D. $2 - \frac{5}{2}y^4 - \frac{3}{2}x^2$

24. If a resistor of R ohms is connected across a battery of E volts with internal resistance r ohms, then the power (in watts) in the external resistor is $P = \frac{E^2 R}{(R + r)^2}$.

If E and r are fixed but R varies, what is the maximum value of power?

- A. $\frac{E^2}{4r}$ B. $\frac{E^2}{16r^2}$ C. $\frac{4r}{E^2}$ D. $\frac{1}{16} \left(\frac{E}{R} \right)$

25. Find the $\lim_{x \rightarrow \infty} (x - \ln x)$

- A. 1 B. 0 C. ∞ D. e