

# TMATYC - Calculus A Test – 2011

## 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 D E).**

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# TMATYC - Calculus A Test – 2011

## 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 = \_\_\_\_\_

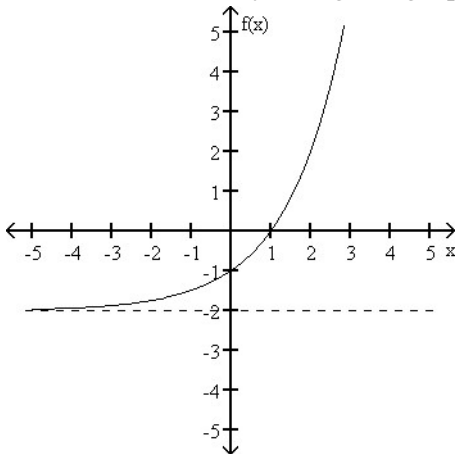
**TMATYC**  
**Calculus A Test Fall 2011**

1.) Find the limit.

$$\lim_{x \rightarrow -2} \frac{1}{x + 2}$$

- A)  $\infty$       B)  $\frac{1}{2}$       C)  $-\infty$       D) Does not exist

2.) Find  $\lim_{x \rightarrow \infty} f(x)$  by using the graph below



- A)  $\infty$       B) Does not exist      C)  $-2$       D)  $0$

3.) Find all vertical asymptotes of the given function.

$$h(x) = \frac{x + 6}{x^2 - 49}$$

- A)  $x = 0, x = 49$       B)  $x = 49, x = -6$   
C)  $x = -7, x = 7, x = -6$       D)  $x = -7, x = 7$

4.) Find the intervals on which the function is continuous.

$$y = \sqrt{3x + 6}$$

- A) continuous on the interval  $(-\infty, -2]$       B) continuous on the interval  $[2, \infty)$   
C) continuous on the interval  $[-2, \infty)$       D) continuous on the interval  $(-2, \infty]$

5.) Find  $y'$

$$y = (5x^3 + 8)(2x^7 - 4)$$

A)  $20x^9 + 112x^6 - 60x$

B)  $100x^9 + 112x^6 - 60x$

C)  $100x^9 + 112x^6 - 60x^2$

D)  $20x^9 + 112x^6 - 60x^2$

6.) Find the derivative of the function.

$$r = \frac{(\sqrt{\theta} - 9)}{(\sqrt{\theta} + 9)}$$

A)  $r' = -\frac{9}{\sqrt{\theta}(\sqrt{\theta}+9)^2}$

B)  $r' = \frac{18}{(\theta+9)\sqrt{\theta^2-81}}$

C)  $r' = \frac{9}{\sqrt{\theta}(\sqrt{\theta}+9)^2}$

D)  $r' = \frac{9}{\theta+9}$

7.) The number of gallons of water in a swimming pool  $t$  minutes after the pool has started to drain is  $Q(t) = 50(20 - t)^2$ . How fast is the water running out at the end of 15 minutes?

A) 625 gal/min

B) 500 gal/min

C) 1250 gal/min

D) 250 gal/min

8.) Find  $y''$  if  $y = 6x \sin x$

A)  $y'' = -12 \cos x + 6x \sin x$

B)  $y'' = 12 \cos x - 6x \sin x$

C)  $y'' = 6 \cos x - 12x \sin x$

D)  $y'' = -6x \sin x$

9.) Does the graph of the function  $y = 2x + 4 \sin x$  have any horizontal tangents in the interval  $0 \leq x \leq 2\pi$ ? If so, where?

A) Yes, at  $x = \frac{2\pi}{3}$

B) No

C) Yes, at  $x = \frac{\pi}{3}, x = \frac{2\pi}{3}$

D) Yes, at  $x = \frac{2\pi}{3}, x = \frac{4\pi}{3}$

10.) Find  $dy/dt$  for  $y = 5t(3t + 3)^4$

A)  $5(3t + 3)^3(15t + 3)$

B)  $5(3t + 3)^3$

C)  $5(3t + 3)^4(7t + 3)$

D)  $5(15t + 3)^3$

11.) Find  $y''$  for the function  $y = \sqrt{9x + 6}$

- A)  $\frac{9}{2\sqrt{9x+6}}$       B)  $-\frac{81\sqrt{9x+6}}{4}$       C)  $-\frac{81}{4(9x+6)^{\frac{3}{2}}}$       D)  $-\frac{1}{4(9x+6)^{\frac{3}{2}}}$

12.) Given  $x^3 + 3x^2y + y^3 = 8$ , use implicit differentiation to find  $dy/dx$ .

- A)  $-\frac{x^2+2xy}{x^2+y^2}$       B)  $\frac{x^2+3xy}{x^2+y^2}$       C)  $-\frac{x^2+3xy}{x^2+y^2}$       D)  $\frac{x^2+2xy}{x^2+y^2}$

13.) Water is falling on a surface, wetting a circular area that is expanding at a rate of  $2 \text{ mm}^2/\text{s}$ . How fast is the radius of the wetted area expanding when the radius is 174 mm? (Round your answer to four decimal places.) Recall that the formula for the area of a circle is  $A = \pi r^2$

- A) 0.0018 mm/s      B) 0.0115 mm/s      C) 0.0037 mm/s      D) 546.6367 mm/s

14.) Find equations of the tangent lines to the curve  $y = \frac{x-8}{x+8}$  that are parallel to the line  $x - y = 8$

- I.  $x - y = -17$       II.  $x - y = -12$       III.  $x - y = -15$       IV.  $x - y = -1$       V.  $x - y = -4$

- A) II and III  
B) I and IV  
C) II and V  
D) I and V

15.) Use logarithmic differentiation to find the derivative of the function  $y = x^{6x}$

- A)  $y' = 6x^{6x}(6 \ln x + 1)$   
B)  $y' = 6(\ln x + 1)$   
C)  $y' = 6x^{6x}(\ln x + 1)$   
D)  $y' = -6x^{6x}(\ln x + 6)$

16.) Two cars start moving from the same point. One travels south at 28 mi/h and the other travels west at 70 mi/h. At what rate is the distance between the cars increasing 5 hours later? Round the result to the nearest hundredth.

- A) 75.42 mi/h      B) 75.49 mi/h      C) 76.4 mi/h      D) 75.39 mi/h

17.) Find the number  $c$  that satisfies the conclusion of the Mean Value Theorem on the given interval.

$$f(x) = 2\sqrt{x}, \quad [0, 9]$$

- A)  $c = 9/4$                       B)  $c = 0$                       C)  $c = 1/4$                       D) none of these

18.) Evaluate the limit.

$$\lim_{x \rightarrow 1^+} \left( \frac{x}{x-1} - \frac{1}{\ln x} \right)$$

- A)  $1/2$                       B) 2                      C) 0                      D)  $\infty$

19.) Find all the critical numbers of the function

$$f(x) = 4x + \sin(4x)$$

- A)  $\frac{\pi}{4}$                       B)  $\frac{\pi(2n+1)}{8}$                       C)  $\frac{\pi n}{2}$                       D)  $\frac{\pi(2n+1)}{4}$

20.) Given  $f'(t) = 2t - 3 \sin t$  and  $f(0) = 5$ , find  $f$

- A)  $f(t) = t^2 + 3 \cos t + 2$   
B)  $f(t) = 2t - 3 \sin t + 5$   
C)  $f(t) = t^2 - 3 \cos t - 5$   
D) none of these

21.) Find the dimensions of the rectangle of largest area that can be inscribed in an equilateral triangle with a side length of 9 cm if one side of the rectangle lies on the base of the triangle. Round the result to the nearest tenth.

- A) 9.5 cm, 3.9 cm  
B) 7.5 cm, 2.9 cm  
C) 4.5 cm, 4 cm  
D) 4.5 cm, 3.9 cm

22.) Find the most general antiderivative of the function

$$f(x) = 18x^2 - 14x + 9$$

- A)  $F(x) = 30x^5 - 28x^4 + 9x + C$   
B)  $F(x) = 6x^3 - 7x^2 + 9x + C$   
C)  $F(x) = 18x^3 - 14x^2 + 9x + C$   
D)  $F(x) = 36x - 14 + C$

23.) Find the absolute maximum value of  $y = \sqrt{36 - x^2}$  on the interval  $[-6, 6]$

A) 5

B) 6

C) 7

D) 0

24.) Which of the following points lie in an interval where the graph of  $f(x) = x^4 - 2x^3 - 2x^2 - 7$  is decreasing and concave down?

A) (1, -10)

B) (2, -15)

C) (3, 2)

D) (-1, -6)

25.) Evaluate the limit

$$\lim_{x \rightarrow a} \frac{x - a}{x^3 - a^3}$$

A)  $\frac{1}{a^2}$

B)  $\frac{1}{3a^2}$

C) 0

D) Does not exist