TMATYC - Precalculus 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 - Precalculus Test – 2011
Answer Sheet

Name: _____   School: _____

Address: _____

Current Math Class: _____   Math Teacher: _____

	Student's Response	Scorer
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Email: _____

Phone: _____

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

Have you ever been enrolled in a college-level calculus class?   Yes   No

For Scorer:

Number Correct   =   _____

Number Incorrect   =   _____

Number Blank   =   _____

Num Correct $\times$ 4   =   _____

– Num Incorrect   =   _____
_____

Score on Test   =   _____

TMATYC

PRECALCULUS EXAM - Fall 2011

1. Simplify: $\dfrac{\frac{1}{x^2} + x}{\frac{1}{x^2} - \frac{1}{x} + 1}$

   A. $(x - 1)$ 　　　　 B. $(1 - x)$ 　　　　 C. $(x^2 - x)$ 　　　　 D. $(1 + x)$

2. Factor and simply the result: 　 $(x + 1)^{-\frac{2}{3}} \, x^{\frac{2}{3}} + 2(x + 1)^{\frac{1}{3}} \, x^{-\frac{1}{3}}$

   A. $\dfrac{3x + 2}{x^{\frac{1}{3}} (x + 1)^{\frac{2}{3}}}$ 　　　　 B. $\dfrac{x + 2}{x}$ 　　　　 C. $(x + 1)^{\frac{1}{3}} \, x$ 　 D. The expression doesn't factor.

3. Solve for x: 　 $\log(x) + \log(x - 2) = \log(8 - 4x)$

   A. $\{-4, 2\}$ 　　　　 B. $\{-2, 4\}$ 　　　　 C. No solution 　　　　 D. $\{2\}$

4. What value of k 　 makes $(x - 2)$ a factor of $2kx^3 - 4\,kx^2 + 5kx - 20$?

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

5. The radius of the circle $x^2 + y^2 + 4x - 6y + 6 = 0$ is

   A. 6 　　　　 B. $\sqrt{6}$ 　　 C. 7 　　　　 D. $\sqrt{7}$

6. A train and a plane leave from a town at 2 p.m. for a destination 900 miles away. The rate of the plane is six times the rate of the train. The plane arrives 15 hours before the train. Assuming they travel at a constant rate, what is the rate of the train and the plane in miles per hour?

   A. train = 30, plane = 100 　B. train = 50, plane = 300

   C. train = 40, plane = 240 　D. train = 60, plane = 360

7. Simplify the expression: 　 $\dfrac{2 - \tan\theta}{2\csc\theta - \sec\theta}$

   A. $1 - \sin\theta \cos\theta$ 　　　　 B. $\dfrac{\cot\theta - 2}{\cot\theta - 3}$ 　　　　 C. $\sin\theta$ 　　　　 D. $\sin\theta$

8. Two automobiles leave a city at the same time and travel along straight highways that differ in direction by 84°. If their speeds are 60 mph and 46 mph respectively, approximately how far apart are the cars at the end of 30 minutes? (Rounded to the nearest mile)

    A. 56   B. 36   C. 45   D. 49

9. Find the inverse of the function $f(x) = \frac{4x - 9}{5x - 5}$.

    A. f is not a one-to-one function   B. $\frac{5x - 4}{5x - 9}$

    C. $\frac{5x - 9}{5x - 4}$ D. $\frac{4x - 9}{5x - 5}$

10. If $3000 is invested in an account that pays interest compounded continuously, how long will it take to grow to $9,000 at 7%?

    A. 7.7 years   B. 15.7 years   C. 17.3 years   D. 10 years

11. Find all zeros of $f(x) = 3x^3 \ln x + 4x^2 \ln x - 4x \ln x$.

    A. 1, $^2/_3$ B. 0, 1, −2, $^2/_3$ C. 0, 1, $^2/_3$ D. 0, 1

12. Write the quadratic function in the form $y = a(x - h)^2 + k$. Given $y = x^2 + 18x + 84$.

    A. $y = (x + 9)^2 - 3$ B. $y = (x + 9)^2 + 3$

    C. $y = (x - 9)^2 - 3$ D. $y = (x - 9)^2 + 3$

13. Find the exact value of the expression $\sin\left[\cos^{-1}\left(-\frac{1}{2}\right)\right]$.

    A. $\frac{\sqrt{6}}{2}$ B. $\frac{\sqrt{10}}{2}$ C. $\frac{\sqrt{7}}{2}$ D. $\frac{\sqrt{3}}{2}$

14. Solve: $\log_8(3x - 2) = 1$.

    A. $\frac{3}{10}$ B. 1   C. -2   D. $\frac{10}{3}$

15. Find the solutions of the equation $2\tan t - \sec^2 t = 0$ that are in the interval $[0, 2\pi]$.

A. $\dfrac{\pi}{4}, \dfrac{7\pi}{4}$ 　　　 B. $\dfrac{2\pi}{3}, \dfrac{5\pi}{3}$ 　　　 C. $\dfrac{\pi}{2}, \dfrac{3\pi}{2}$ 　　　 D. $\dfrac{\pi}{4}, \dfrac{5\pi}{4}$

16. Write an equation of $f(x) = |x|$, but moved 4 units to the left and reflected about the x-axis.

A. $y = |x - 4|$ 　　　　　　　　　　　　 B. $y = -|x + 4|$

C. $y = -|x| - 4$ 　　　　　　　　　　　 D. $y = -|x - 4|$

17. A regular pentagon is inscribed in a circle with a radius of 10 centimeters. Approximate the perimeter of the pentagon (in cm).

A. 50 　　　　　　 B. 40.5 　　　　　　 C. 58.8 　　　　　　 D. 29.4

18. Given $y = 3\tan\left(x - \dfrac{\pi}{4}\right)$, what is the phase shift?

A. 3 　　　　　 B. $\dfrac{\pi}{4}$ 　　　　　 C. $\dfrac{1}{\pi}$ 　　　　　 D. $-\dfrac{\pi}{4}$

19. Solve for x given $\log_2(x + 2) - \log_2(x - 5) = 3$.

A. 6 　　　　　　 B. 5 　　　　　　 C. $\varnothing$ 　　　　　　 D. 3

20. What is $\arcsin\left(\dfrac{x}{\sqrt{x^2 + 1}}\right)$?

A. $\dfrac{1}{\sqrt{x^2 + 1}}$ 　　　 B. $\sqrt{x^2 + 1}$ 　　　 C. $\dfrac{1}{x}$ 　　　 D. x

21. If an organism contains A_0 milligrams of C_{14} at its death, the amount $A(x)$ of C_{14} remaining x years later is $A(x) = A_0 e^{-0.000124x}$ milligrams. For a fossilized bone discovered and estimated to be 5,000 years old, determine the percentage of C_{14} remaining in the bone when it was discovered. Round your answer to the nearest percent.

A. 54% 　　　　　　 B. 46% 　　　　　　 C. 48% 　　　　　　 D. 52%

22. The equation in standard form of the line tangent to the circle $x^2 + y^2 = 25$ at the point $(-4, \ 3)$ is:

A. $4x - 3y = -25$

B. $3x - 4y = -25$

C. $3x + 4y = 25$

D. $3x + 4y = -25$

23. We are given a circle made of wire. The circle has a circumference of 18 meters. The wire will be cut into two pieces. One piece will be formed into a square and the second into another smaller circle. Let x be the side of the square. Select a function $A(x)$ that represents the combined areas of the square and smaller circle.

A. $A(x) = x^2 + \pi x^2$

B. $A(x) = x^2 + \frac{(9 - 2x)^2}{\pi}$

C. $A(x) = x^2 + \pi(18 - 4x)^2$

D. $A(x) = x^2 + \pi \, (18 - x^2)$

24. What does $\frac{\log_7 10}{\log_{10} 7}$ simplify to?

A. 1

B. $\frac{7}{10}$

C. $\frac{1}{(\log 7)^2}$

D. $\log 7$

25. Approximate the area of a parallelogram that has sides of lengths 11 and 16 if one angle at a vertex has measure 40°. (Round answer to the nearest tenth.)

A. 108.9

B. 113.1

C. 109.8

D. 115.7