TMATYC

PRECALCULUS TEST

Spring 2003

1. Solve the formula for p: $\frac{1}{h} = \frac{1}{w} + \frac{1}{p}$

   A. $p = \frac{h - w}{hw}$ B. $p = \frac{hw}{w + h}$ C. $p = \frac{hw}{h - w}$ D. $p = \frac{hw}{w - h}$

2. Write the expression $\frac{-4 + 6i}{2 + 5i}$ in the form *a* + *bi* where *a* and *b* are real numbers.

   A. $\frac{22}{29}$ B. $\frac{22}{29} + \frac{32i}{29}$ C. $\frac{22}{29} - \frac{32i}{29}$ D. $\frac{32i}{29}$

3. Solve the equation: $\sqrt{39 - x} = x - 9$

   A. 3, 14 B. 14 C. 3 D. No solution

4. Solve the inequality: $\frac{x^2 - x}{x^2 + 13x} \le 0$

   A. $(-13, 0) \cup (0, 1]$ B. $(-\infty, -13]$ C. (-13, 1] D. $[-13, \infty)$

5. Find a general form of the equation of the line through the point A(3, -1) which is perpendicular to the line 6x – 7y = 8.

   A. 7x + 6y = 15 B. 15x + 6y = –7 C. x + 6y = 0 D. 6x – y = 0

6. Find a general form of the equation of the line that is tangent to the circle at the point P.

   Circle: $x^2 + y^2 = 100$; P(6, 8)

   A.4x + 3y = 100 B. y = 100 C. 3x + 4y = 50 D. 2x + 3y = 75

7. The owner of an ice cream franchise must pay the parent company $1,200 per month plus 7% of the monthly revenue R. Operating cost of the franchise includes a fixed cost of $2,784 per month for items such as utilities and labor. The cost of ice cream and supplies is 45% of the revenue. Determine the monthly revenue needed to break even.

   A. $4, 250 B. $16,600 C. $8,300 D. $12, 500

8. Solve the system: $\begin{aligned} x^3 - y^3 &= 19 \\ x^2 + xy + y^2 &= 19 \end{aligned}$

A. (-2, -3), (3, 2) B. (-3, 2), (-2, 3) C. (2, -3), (2, 3) D. (3, 2), (-3, -2)

9. Simplify the expression $(5) + (5x - 1)^{\frac{1}{2}}(16)(2X + 1)^7(8)$

A. $\dfrac{(2x+1)^7(632x-117)}{(5x-1)^{\frac{1}{2}}}$ B. $\dfrac{(2x-1)^7(642x-127)}{(5x-1)^{\frac{1}{2}}}$

C. $\dfrac{(2x+1)^7(652x-137)}{(5x-1)^{\frac{1}{2}}}$ D. $\dfrac{(2x+1)^7(652x-117)}{(5x-1)^{\frac{1}{2}}}$

10. A bullet is fired horizontally at a target, and the sound of its impact is heard 1.3 seconds later. If the speed of the bullet is 3,300 ft/sec and the speed of sound is 1,100 ft/sec, how far away is the target?

A.1,430 ft. B. 1,072.5 ft. C. 1,187.5 ft. D. 5,720 ft.

11. Use the quadratic formula to solve the equation for x in terms of y: $20x^2 - 20xy + 15(1 - y^2) = 0$

A. $x = \dfrac{y \pm 3\sqrt{2y^2 - 1}}{2}$ B. $x = \dfrac{y \pm 3\sqrt{y^2 - 1}}{2}$

C. $x = \dfrac{y \pm \sqrt{4y^2 - 3}}{2}$ D. $x = \dfrac{y \pm 9\sqrt{3y^2 - 3}}{2}$

12. A parabola has the equation $y = 2x^2 - 4x + 3$, and a circle has the equation $x^2 + y^2 - 4x + 6y + 7 = 0$. What is the equation of the line segment that connects the vertex of the parabola with the center of the circle?

A. 4x + y = 5 B. x + 4y = 5 C. – x + 4y = 3 D. 4x – y = 3

13. If $2y^2 + 4xy - 3x = 0,$ determine the set of all values of 'x' for which the corresponding 'y' roots are real.

A. $x < -\dfrac{3}{2}$ and $x > 0$ B. $x \le 0$ and $x \ge \dfrac{3}{2}$

C. $x \le -\dfrac{3}{2}$ and $x \ge 0$ D. $x < 0$ and $x > \dfrac{3}{2}$

14. Find the standard equation of a parabola that opens vertically and satisfies the conditions:

x-intercepts are –3 and 5, highest point has y-coordinate 4.

A. $y = (x + 3)^2 + 5$ B. $y = \frac{-1}{4}(x - 1)^2 + 4$

C. $y = \frac{-1}{5}(x + 1)^2 + 4$ D. $y = \frac{-1}{5}(x + 1)^2 + 4$

15. If an object is projected vertically upward from ground level with an initial velocity of v_o ft/sec, then its distance s(t) in feet above the ground after t seconds is given by the formula $s(t) = -16t^2 + v_o t$. If the object hits the ground after 15 seconds, find its initial velocity v_o.

A. 300 ft/sec B. 240 ft/sec C. 210 ft/sec D. 225 ft/sec

16. Poiseuille's law states that the blood flow rate F (in L/min) through a major artery is directly proportional to the product of the fourth power of the radius *r* and the blood pressure *P*. During heavy exercise, normal blood flow rates may triple. If the radius of a major artery also increases by 10%, approximately how much harder must the heart pump during heavy exercise?

A. about 1.80 times as hard B. about 2.05 times as hard

C. about 1.68 times as hard D. about 3.19 times as hard

17. An urban density model is a formula that relates the population density D (in thousands/ mi^2) to the distance *x* (in miles) from the center of the city. The formula $D = ae^{-bx}$ for the central density *a* and coefficient of decay *b* has been found to be appropriate for many large U.S. cities. For the city of Atlanta in 1970, *a* = 5.5 and *b* = 0.10. At approximately what distance was the population density 2,400 per square mile?

A. 10.6 mi B. 7.2 mi C. 3.6 mi D. 8.3 mi

18. Use natural logarithms to solve for x in terms of y: $y = \frac{e^x + e^{-x}}{14}$

A. $x = \ln\left(49y - \sqrt{y^2 - 7}\right)$ B. $x = \ln\left(7y + \sqrt{14y^2 - 1}\right)$

C. $x = \ln\left(14y \pm \sqrt{49y^2 + 1}\right)$ D. $x = \ln\left(7y \pm \sqrt{49y^2 - 1}\right)$

19. A tire for a compact car is 22 inches in diameter. If the car is traveling at a speed of 65 mi/hr, find the number of revolutions the tire makes per minute.

A. 972 rev/min B. 993 rev/min C. 1,006 rev/min D. 982 rev/min

20. Find all solutions of the equation: sin (ln x) = 0

A. $\frac{\pi}{2} + \pi n$ for every integer n B. πn for every integer n

C. $e^{\frac{\pi}{2} + \pi n}$ for every integer n D. $e^{\pi n}$ for every integer n

21. Use half-angle formulas to find the exact value: $\tan \frac{3\pi}{8}$.

A. $\sqrt{2} - 1$ B. $\sqrt{2} - 1$ C. $\sqrt{2} + 1$ D. $\frac{1}{2}\sqrt{2 - \sqrt{2}}$

22. Find the exact value of the expression: $\sin\left[2\arccos\left(-\frac{4}{5}\right)\right]$

A. $-\frac{23}{25}$ B. $-\frac{22}{25}$ C. $-\frac{24}{25}$ D. $-\frac{21}{25}$

23. 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 mi/hr and 45 mi/hr, respectively, approximately how far apart are the cars at the end of 10 minutes?

A. 18 mi B. 15 mi C. 12 mi D. 14 mi

24. A triangular field has sides of lengths a = 280, b = 350, and c = 500 (in yards). Approximate the number of acres in the field. (1 acre = 4840 square yds.)

A. 9.19 acres B. 9.80 acres C. 11.00 acres D. 10.13 acres

25. Approximate the area of a parallelogram that has sides of lengths a and b if one vertex angle has measure θ:

$\alpha = 12.0,\ \beta = 16.0,\ \theta = 40°$.

A. 127.6 B. 20.1 C. 126.0 D. 123.4

1	D
2	B
3	B
4	A
5	A
6	C
7	C
8	A
9	B
10	B
11	C
12	A
13	C
14	B
15	B
16	B
17	D
18	D
19	B
20	D
21	C
22	C
23	C
24	B
25	D