TMATYC - Precalculus Test - 2014

1. Write the equation of the line through the points (6, 9) and (4, 1).

A. $4x - y = 15$ B. $4y - x = 30$ C. $4x - y = 30$ D. $4x + y = 33$ E. $x + 4y = 42$

2. Find $f(x-7)$ for $f(x) = x^2 - 5$

A. $x^2 - 54$ B. $x^2 - 7x + 44$ C. $y = x^2 - 7x - 54$

D. $y = x^2 - 14x - 54$ E. $y = x^2 - 14x + 44$

3. Solve the exponential equation, $e^{4x} = 9$, for x

A. $\ln\left(\frac{9}{4}\right)$ B. $\frac{\ln 9}{4}$ C. $9\ln 4$ D. $\frac{9}{4e}$ E. $\frac{9}{\ln 4}$

4. Which describes the solution to the rational inequality: $\frac{x^2 - 4x + 4}{x^2 - 10x + 24} \leq 0$

A. 1 open interval B. 2 open intervals C. 1 open interval and a single point

D. 1 closed interval E. 1 closed interval and a single point

5. Simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$, $h \neq 0$ if $f(x) = 3x^2 - 4$

A. $\frac{3h^2 - 4}{h}$ B. $\frac{6xh + 3h^2 - 8}{h}$ C. $6x + 3h$ D. $3h$ E. 1

6. Give the equation of a circle in standard form with center $(3, -5)$ and radius of 4.

A. $(x-3)^2 + (y+5)^2 = 16$ B. $(x+3)^2 + (y-5)^2 = 16$ C. $(x-3)^2 + (y+5)^2 = 4$

D. $(x+3)^2 + (y-5)^2 = 4$ E. $(x-3)^2 + (y+5)^2 = 2$

7. Find the solutions to the equation, $\log(x^2 - 48) = \log(-13x)$

A. 1 positive solution B. 2 positive solutions C. 1 negative solution

D. 1 positive and 1 negative solution E. no solution

8. Which of the following is an even function?

A. $y = \sqrt{x}$ B. $y = x^3$ C. $y = \tan x$ D. $y = \sin x$ E. $y = \cos x$

9. Which of the following rational functions could have a graph with a horizontal asymptote at $y = k$ if a, b, c, and d are distinct real numbers?

A. $y = \frac{k(x-a)}{(x-c)(x-d)}$ B. $y = \frac{k(x-a)(x-b)}{(x-c)(x-d)}$ C. $y = \frac{k(x-a)(x-b)}{(x-c)}$

D. $y = \frac{(x-a)}{(x-k)}$ E. $y = \frac{(x-k)}{(x-c)}$

10. A farmer plans to fence two adjacent rectangular corrals of the same size along the side of a building, where the corrals both have a side adjacent to the building. Assume the side of the corrals that is against the building will not be fenced. She has 480 feet of fencing materials. Determine the maximum total area (in square feet) of both corrals that can be fenced.

A. 4,800 B. 7,200 C. 9,600 D. 14,400 E. 19,200

11. If $m(q) = 3|q + 8| + 4$ then $m(2 - t) =$

A. $3|t - 10| + 4$ B. $3|10 + t| + 4$ C. $34 - 3t$ D. $-3|t - 10| + 4$ E. $3|2 - t| + 28$

12. If $g(x) = f(x + 4) + 9$, then the graph of g is obtained by shifting the graph of $f(x)$

A. right 4 units and down 9 units B. right 4 units and up 9 units C. left 4 units and down 9 units

D. left 4 units and up 9 units E. right 9 units and up 4 units

13. For $f(x) = 2mx - nx^2$, if $f(-3) = 6$ and $f(1) = 2$, then find the sum of m and n

A. $-\frac{1}{2}$ B. 0 C. $\frac{3}{2}$ D. 2 E. 4

14. For $f(x) = x^2 + 5, x \le 0$ and $g(x) = -\sqrt{x - 5}$, simplify the expression $g(f(x))$.

A. $-x - \sqrt{5}$ B. $\sqrt{x^2}$ C. $|x|$ D. x E. $-x$

15. If $f(x) = \frac{2x - 3}{x + 5}$, find $f^{-1}(x)$, if it exists

A. $\frac{x - 5}{2x + 3}$ B. $\frac{3 - 5x}{x + 2}$ C. $\frac{5x + 3}{x - 2}$ D. $\frac{5x + 3}{2 - x}$ E. Does not exist

16. For the following system of equations, find the product xyz.

$$\begin{aligned} 5x + 3y - 2z &= 59 \\ -2x - 4z + 7y &= 18 \\ 3x - y - 9z &= -26 \end{aligned}$$

A. 22 B. 360 C. 490 D. 585 E. 724

17. Factor and simplify the expression $x(x - 4)^{-1/2} + x^{-2}(x - 4)^{1/2}$

A. $x\sqrt{x - 4}\left(1 + \frac{1}{x}\right)$ B. $\frac{\sqrt{x - 4}\,(x^2 + 1)}{x}$ C. $\frac{x - 4}{x}$

D. $\frac{x + 1}{x\sqrt{x - 4}}$ E. $\frac{x^3 + x - 4}{x^2\sqrt{x - 4}}$

18. Find the domain of the function $g(x) = -a\sqrt{\ln(bx + c)}$ if a, b, and c are positive real numbers

A. $\left[\frac{1 - c}{b}, \infty\right)$ B. $\left[-\frac{c}{b}, \infty\right)$ C. $(-\infty, a)$ D. $\left(-\frac{c}{b}, a\right)$ E. $(-\infty, \infty)$

19. Find the range of the function, $h(x) = 3\log_4(x - 2)$

A. $(0, \infty)$ B. $(2, \infty)$ C. $(3, \infty)$ D. $(4, \infty)$ E. $(-\infty, \infty)$

20. For the equation $y = P(5)^{-mT}$, solve for m in terms of y, P, and T. $m =$

A. $\dfrac{-\log y}{T\log(5P)}$ B. $\dfrac{\log P - \log y}{T\log 5}$ C. $\dfrac{-\log(\frac{y}{5})}{TP}$ D. $\dfrac{\log(\frac{5P}{y})}{T}$ E. $\dfrac{-\log y}{TP\log 5}$

21. Classify the type of conic equation given by $12x^2 + 96x + 190 = 7y(y-6) + 145$

A. circle B. parabola C. ellipse D. hyperbola E. line

22. If α and β are acute angles such that $\sin\alpha = \frac{4}{5}$ and $\tan\beta = \frac{15}{8}$, find $\tan(\alpha+\beta)$

A. $-\frac{77}{36}$ B. $-\frac{13}{84}$ C. $\frac{11}{7}$ D. $\frac{77}{24}$ E. undefined

23. Write the expression, $\cos\left[\tan^{-1}\left(\frac{1}{4}t\right)\right]$, as an algebraic expression in t

A. $\csc\left(\frac{1}{4}t\right)$ B. $\dfrac{4}{\sqrt{t^2+16}}$ C. $\dfrac{t}{\sqrt{t^2+16}}$ D. $\dfrac{2}{\sqrt{t^2+4}}$ E. $\dfrac{1}{\sqrt{1+\frac{1}{4}t^2}}$

24. Two points, L and R, on level ground are directly to the west and east of a building, respectively. To find the distance between L and R, a surveyor chooses a point S, also on ground level due south of the building, that is 532 feet from point L and 378 feet from point R. The surveyor also determines that the angle LSR is 64°. Approximate the distance between points L and R to the nearest foot.

A. 154 B. 399 C. 500 D. 620 E. 818

25. The equation, $\sin\theta = -\frac{1}{2}$, has how many solutions?

A. 1 B. 2 C. 4 D. infinitely many E. none