TMATYC - Precalculus Test - 2013

1. Given $f(x) = x^2 + x - 1$, find $f(3x + 2)$

A. $9x^2 + 3x + 5$ B. $9x^2 + 15x + 5$ C. $9x^2 + x + 3$ D. $9x^2 + 15x + 6$ E. $3x^2 + 3x - 1$

2. Write an equation of the line that contains the points $(1, 1)$ and $(-2, -2)$ in slope-intercept form

A. $y = x$ B. $y = x - 1$ C. $y = -x$ D. $y = -x - 1$ E. $y = -2x$

3. Given $f(x) = 1 - x^2$ and $g(x) = x^2 + x - 2$, find $(f/g)(x)$ in **simplified** form

A. $\frac{x^2 - 1}{x^2 + x - 2}$ B. $-\frac{1}{x - 2}$ C. $\frac{x + 1}{x + 2}$ D. $-\frac{x + 1}{x + 2}$ E. 1

4. Solve the polynomial inequality: $x^3 + 2x^2 - 3x \leq 0$

A. No solution B. $(-\infty, -3) \cup (0, 1)$ C. $(-\infty, 1]$ D. $(-\infty, -3] \cup [0, 1]$ E. $[-3, 1]$

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

A. $2x + h + 2$ B. $2x + h + 1$ C. $2x + h^2 + 2h$ D. $h + 2$ E. 1

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

A. 2 B. 3 C. 4 D. 6 E. 9

7. Solve for x : $2\ln(x) = \ln(x + 1) - \ln 2$

A. No solution B. $\{-1\}$ C. $\left\{-\frac{1}{2}, 1\right\}$ D. $\left\{-\frac{1}{2}\right\}$ E. $\{1\}$

8. Find the horizontal asymptote of the function $f(x) = \frac{x^3 + 2x^2 + x - 2}{2x^4 + 3x^3 - x^2 + x - 1}$

A. $y = \frac{1}{2}$ B. $y = \frac{3}{4}$ C. $y = 0$ D. $y = 1$ E. There is no horizontal asymptote

9. An item that regularly costs \$23.95 is on sale with a 15% discount. What is the discounted sale price of the item?

A. \$15.97 B. \$20.36 C. \$22.45 D. \$23.59 E. \$23.80

10. Find the domain of the function $g(x) = \frac{\sqrt{x - 2}}{x^2 - 9}$

A. All real numbers B. $[2, \infty)$ C. $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$ D. $(3, \infty)$ E. $[2, 3) \cup (3, \infty)$

11. If $p(r) = \sqrt{r + 2} + 5$ then $p(z - 2) =$

A. $\sqrt{z} + 5$ B. $\sqrt{z + 5}$ C. $\sqrt{z + 2} + 3$ D. $\sqrt{r + z} + 5$ E. $(z - 2)\sqrt{r + 2} + 5$

12. Determine the value of A so that the line whose equation is $Ax + 2y - 5 = 0$ is perpendicular to the line containing the points $(2, -6)$ and $(-2, 2)$

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

13. If $g(x) = f(x-2) + 3$, then the graph of g is obtained by shifting the graph of f

A. right 2 and up 3 B. left 2 and up 3 C. right 3 and down 2 D. left 3 and down 2 E. up 1

14. If $f(x) = 3 - x$ and $g(x) = 4x^2 + x + 6$ then $(g \circ f)(x) =$

A. $-4x^2 - x - 3$ B. $-4x^2 - x + 45$ C. $-4x^2 + x + 9$ D. $4x^2 - 23x + 39$ E. $4x^2 - 25x + 45$

15. If $f(x) = (2x+5)^3$, then $f^{-1}(x) =$

A. $\dfrac{1}{(2x+5)^3}$ B. $\sqrt[3]{\frac{1}{2}x - 5}$ C. $\sqrt[3]{2x+5}$ D. $\sqrt[3]{\dfrac{x-5}{2}}$ E. $\dfrac{\sqrt[3]{x} - 5}{2}$

16. What is the range of the function $g(x) = -3(x-h)^2 + k$

A. (k, ∞) B. $(-\infty, k)$ C. $(-\infty, h)$ D. (h, k) E. $(-\infty, \infty)$

17. A lawyer drives from her home, located 7 miles east and 6 miles north of the town courthouse, to her office, located 2 miles west and 6 miles south of the courthouse. Find the distance in miles between the lawyer's home and her office.

A. 9 B. 13 C. 15 D. 21 E. 25

18. $\dfrac{9}{4-i} =$

A. $\frac{9}{4} - \frac{9}{i}$ B. $\frac{36}{17} + \frac{9}{17}i$ C. $\frac{36}{15} - \frac{9}{15}i$ D. $\frac{12}{5} - \frac{3}{5}i$ E. $\frac{9}{5}i$

19. If b and c are integers, which one of the following could possibly be a zero of the polynomial function $y = 4x^3 + bx^2 + cx - 15$?

A. $-\frac{4}{3}$ B. $-\frac{3}{4}$ C. $\frac{2}{5}$ D. 4 E. 30

20. Initially, k percent of a population is infected with a disease. The percentage, P, of the population infected with the disease x days later is $P = k - b\log_2 x$ where $b > 0$. Express the number of days (in terms of k and b) that must elapse until $0.5k$ percent of the population is infected.

A. $\frac{0.5k}{\log_2 b}$ B. $\log_2\left(\frac{0.5k}{b}\right)$ C. $2^{(0.5k/b)}$ D. $b(2^{-.5k})$ E. $2^{(-k/b)}$

21. $\tan\left[\sin^{-1}\left(\frac{x}{y}\right)\right] =$

A. $\frac{y}{x}$ B. $\cos^{-1}\left(\frac{x}{y}\right)$ C. $\dfrac{\sqrt{y^2 - x^2}}{y}$ D. $\dfrac{y}{\sqrt{y^2 - x^2}}$ E. $\dfrac{x}{\sqrt{y^2 - x^2}}$

22. If $a \neq 0$ and $b \neq 0$, then what is the domain of function $y = a\sec(bx)$?

A. All real numbers B. $\left\{x | x \neq \frac{k\pi}{4b}, \text{ k is an odd integer}\right\}$ C. $\left\{x | x \neq \frac{k\pi}{2b}, \text{ k is an odd integer}\right\}$

D. $\left\{x | x \neq \frac{k\pi}{b}, \text{ k is an integer}\right\}$ E. $\left\{x | x \neq \frac{ka\pi}{b}, \text{ k is an integer}\right\}$

23. Suppose a certain baseball diamond is a square 85 feet on a side. The pitching mound is located 56 feet from home plate on a line joining home plate and second base. How far is it from the pitching mound to first base? Round to the nearest tenth of a foot.

A. 29.0 ft B. 39.6 ft C. 60.2 ft D. 63.9 ft E. 79.9 ft

24. If $\sec\theta = -5$ and $\tan\theta < 0$, then $\sin\theta =$

A. $-\frac{2\sqrt{6}}{5}$ B. $-\frac{1}{5}$ C. $-\frac{\sqrt{26}}{45}$ D. $\frac{2\sqrt{6}}{5}$ E. $\frac{\sqrt{26}}{45}$

25. Which one of the following statements is true?

A. $\sin bx = b\sin x$ B. $(\sin\theta + \cos\theta)^2 = 1$ C. $\tan(\cos x) = \sin x$

D. $\tan^2 x = \sec^2 x - 1$ E. $\cos^2\alpha = \cos\alpha^2$