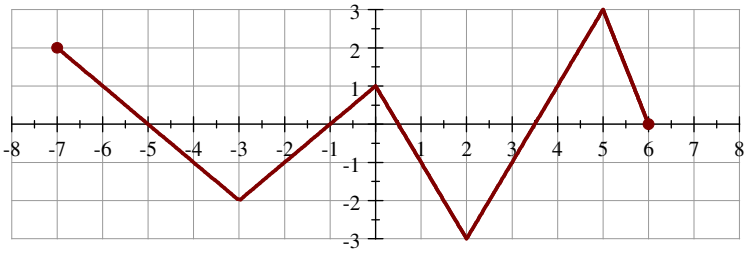
TMATYC - Precalculus Test - 2015

Use the graph of the function $g(x)$ shown below to answer #'s 1 & 2



1. The sum of all the values of x for which $g(x) = 0$ is

A. -2 B. 0 C. 1 D. 2 E. 4

2. The domain of the function g is

A. $(-\infty, \infty)$ B. $[-3, 3]$ C. $[-7, 6]$ D. $[0, \infty)$ E. $[0, 2]$

3. The slope of line 1 is the reciprocal of the y-intercept for line 2 and the y-intercept of line 1 is the reciprocal of the slope of line 2. If these two lines intersect at the point $(2, 0)$ then the product of the two lines' slopes is

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

4. The graph of $-f(x) + 3$ can be obtained from the graph of $f(x)$ by

A. shifting f to the right 3 units and then reflecting about the x-axis
B. shifting f up 3 units and then reflecting about the x-axis
C. shifting f up 3 units and then reflecting about the y-axis
D. reflecting f about the x-axis and then shifting up 3 units
E. reflecting f about the x-axis and then shifting right 3 units

5. Find the diameter of the circle whose equation is $x^2 - 6x + y^2 + 4y - 3 = 0$

A. 2 B. 4 C. 8 D. 16 E. 32

6. At noon, a blue car is 100 miles due east of a red car. The red car is traveling south at 25 miles per hour, while the blue car is traveling west at 40 miles per hour. Express the distance in miles, d, between the cars t hours after noon.

A. $d = \sqrt{(25t)^2 + (100 - 40t)^2}$ B. $d = \sqrt{(25t)^2 + (40t)^2}$ C. $d = \sqrt{(40t)^2 - (25t)^2}$

D. $d = \sqrt{15}\, t^2$ E. $d = 100 - \sqrt{(25t)^2 + (40t)^2}$

7. An equilateral triangle has side length x. What is the altitude of the triangle in terms of x?

A. $\frac{\sqrt{3}}{2}x$ B. $\frac{\sqrt{2}}{2}x$ C. $\frac{1}{2}x$ D. x E. $\frac{1}{2}x^2$

8. Let $h(x) = ax^2 + bx + c$ with a, b, and c all integers. If $h(-1) = h(3) = 14$ and $ac = 15$, then $a + b + c =$

A. 1 B. 2 C. 7 D. 12 E. 29

9. Which of the following statements is/are true for all real numbers x?

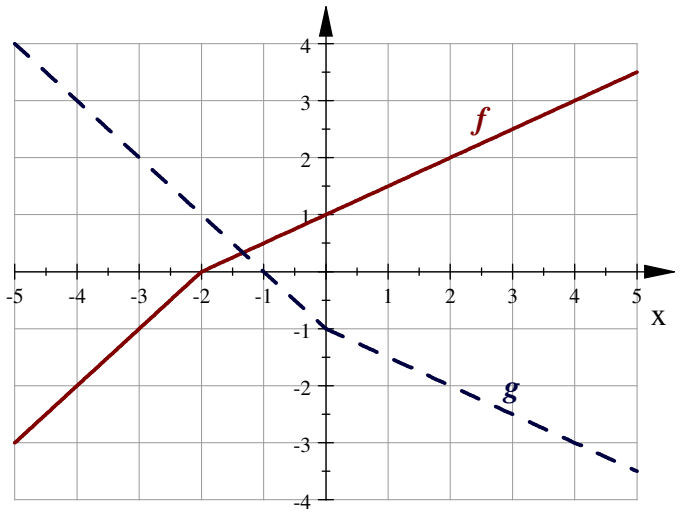
A. $\sqrt{x^2} = x$ B. $|-x| = x$ C. $\tan^2 x + 1 = \sec^2 x$

D. A, B, and C are all true E. None of these statements are true for all real numbers x

10. The first term in a geometric sequence is 2 and the second term is 6. Find the 100th term of the sequence.

A. $3^{100} \times 2$ B. $3^{99} \times 2$ C. $2^{99} + 6$ D. $2 + 99 \times 3$ E. $2 + 100 \times 3$

Use the graphs of the functions f (solid line) and g (dashed line) shown below to answer #'s 11 & 12



11. If $h(x) = f(x + g(x))$, find $h(4)$

A. -5 B. -1 C. 0 D. 1.5 E. 3

12. $g^{-1}(-2) =$

A. 2 B. 1 C. 0 D. -4 E. undefined

13. If c is a complex number and $x - c$ is a factor of the polynomial function $p(x)$, which of the following **may be false**?

A. c is a zero of $p(x)$ B. c is a solution to $p(x) = 0$ C. $p(c) = 0$

D. $(c, 0)$ is an x-intercept for the graph of $p(x)$ E. When $p(x)$ is divided by $x - c$, the remainder is zero

14. Find the solution to the inequality $\sin^2 x + \frac{1}{2}\sin x - \frac{1}{2} \geq 0$ on the interval $[0, 2\pi]$

A. $\left[\frac{7\pi}{6}, \frac{11\pi}{6}\right] \cup \left\{\frac{\pi}{2}\right\}$ B. $\left[\frac{\pi}{6}, \frac{5\pi}{6}\right] \cup \left\{\frac{3\pi}{2}\right\}$ C. $\left[\frac{1}{2}, 2\pi\right]$

D. $\left[\frac{\pi}{3}, \frac{2\pi}{3}\right]$ E. $\left[0, \frac{5\pi}{6}\right] \cup \left[\frac{11\pi}{6}, 2\pi\right]$

15. As $x \to \infty$, the expression $\dfrac{ae^{-x} + be^{1/x}}{a + b\ln\left(\frac{ax}{ax+1}\right)}$ is approaching

A. $\frac{b}{a}$ B. $\frac{a+b}{a}$ C. $\frac{b-a}{a+b}$ D. 1 E. ∞

16. If (x,y) is a solution to the system of equations

$$3\log_4 x + \log_4 y = 2$$
$$\log_2 x - \log_2 y = 4$$

Then the product $xy =$

A. $\frac{1}{4}$ B. 1 C. 4 D. $\frac{16}{3}$ E. 8

17. If a and b are nonzero real numbers, then the vertical asymptote(s) for the function $f(x) = \dfrac{x^2-(a+b)x+ab}{x^2-a^2}$ is/are

A. $x = a, x = b$ B. $y = a,\ y = b$ C. $y = 1$ D. $x = -a,\ x = a$ E. $x = -a$

18. y varies jointly as m and the square root of n and inversely as p^2. $y = 8$ when $m = 2$, $n = 4$, and $p = 3$. What is the value of y when $m = 8$, $n = 9$, and $p = 4$?

A. 6.5 B. 18 C. 27 D. 64 E. 72

19. A substance grows exponentially with a rate of growth of 2% per year. How many years will it take 1 gram of this substance to grow to 2 grams? Round your answer to the nearest year.

A. 5 B. 10 C. 25 D. 35 E. 50

20. From the center of a sphere of diameter 20 feet, two lines are drawn to points A and B on the sphere. If the distance between these two points along the surface of the sphere is 25 feet, what is the angle between these two lines in radians?

A. 0.4 B. 1.25 C. 2.5 D. 5 E. 115

21. $\cos[\tan^{-1}\frac{1}{x}] =$

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

22. If $\sin\alpha = \frac{3}{5}$, $\tan\alpha < 0$, $\cos\beta > 0$, and $\tan\beta = -\frac{5}{12}$, find $\sin(\alpha+\beta)$

A. $\frac{11}{60}$ B. $\frac{14}{65}$ C. $\frac{16}{65}$ D. $\frac{56}{65}$ E. $\frac{64}{65}$

23. If we take the graph of $y = 2\sin(4x+\pi)$ and double its amplitude and period and then shift the resulting graph left $\frac{\pi}{4}$, then the resulting function could be written as

A. $y = 4\sin\left(2x+\frac{3\pi}{4}\right)$ B. $y = 4\sin\left(8x+\frac{3\pi}{4}\right)$ C. $y = 4\sin\left(4x+\frac{\pi}{4}\right)$

D. $y = 4\sin\left(2x-\frac{\pi}{4}\right)$ E. $y = -4\sin(8x)$

24. Suppose a certain baseball diamond is a square 80 feet on a side. The pitching mound is located 54 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. 56.6 B. 58.9 C. 60.1 D. 69.1 E. 90.7

25. Over the interval $[0, 2\pi]$, the equation $\cos(100x) = \frac{1}{2}$ has how many solutions?

A. 2 B. 12 C. 50 D. 200 E. infinitely many