TMATYC

PRECALCULUS TEST

Spring 2005

1. Use $G(x) = \begin{cases} 3x+1, & \text{if } x \le -2 \\ 2x-1, & \text{if } -2 < x \le 0 \\ 4x, & \text{if } 0 < x \end{cases}$ to evaluate $G(3)$.

A. $G(3) = 12$ B. $G(3) = \begin{cases} 10 \\ 5 \\ 12 \end{cases}$ C. $G(3) = 10$ D. $G(3) = 5$

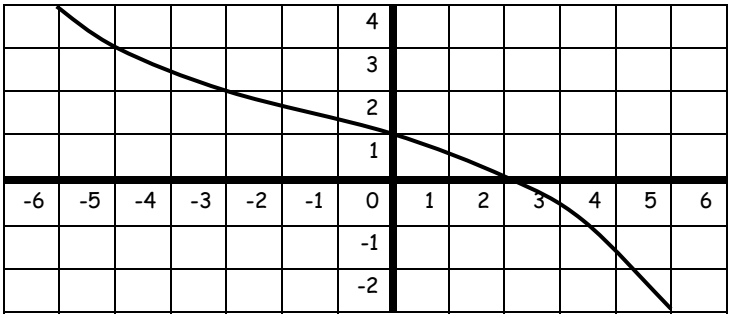
2. Write the complex number $(3 - 4i)^2$ in the standard form a + bi, where a and b are real numbers.

A. 9 + 16i B. 25 C. 25 - 24i D. -7 - 24i

3. Find the domain of the function $F(t) = \dfrac{t-1}{t^2 - 3t - 4}$.

A. $\{t \mid t \neq 1, -1, 4\}$ B. $\{t \mid t \neq -1\}$ C. $\{t \mid t \neq 1, -4\}$ D. $\{t \mid t \neq -1, 4\}$

4. Below is the graph of the function h(t). Use the graph to evaluate $h^{-1}(2)$



A. 0 B. -3 C. 2 D. insufficient information

5. Evaluate $\log_3\left(\sqrt{3}\right)$. A. 1/2 B. -2 C. -1/2 D. 2

6. Simplify: $\ln(e^x e^y)$ A. xy B. x + y C. $e^x + e^y$ D. x/y

7. Define $f(t) = 6 + e^{3t}$. Find f^{-1}, the inverse function of f.

A. $f^{-1}(t) = \dfrac{1}{6+e^{3t}}$ B. $f^{-1}(t) = \dfrac{\ln(t-6)}{3}$ C. $f^{-1}(t) = \dfrac{1}{6} + e^{-3t}$ D. f

8. What is the length of the period of the function f(t) = 15cos(10t + π) ?

A. 15 B. 2π C. $\frac{\pi}{10}$ D. $\frac{\pi}{5}$

9. Which of the following statements about the graph of f(x) = ln(x) are valid ?

statement i. The graph has a horizontal asymptote.

statement ii. The graph has a vertical asymptote along the line x = 0.

statement iii. The graph can be obtained by reflecting the graph of y = e^x about the line y = x.

statement iv. The graph has a y-intercept.

A. i, ii, and iv. B. ii and iii. C. ii and iv D. i., ii., and iii.

10. Let f(t) = 3 - 2t and g(t) = t^2. Determine $(f \circ g)(t)$.

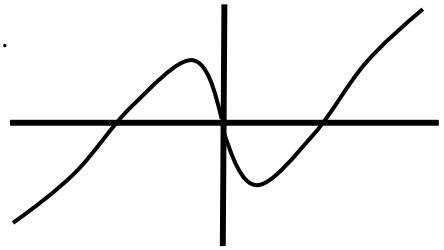
A. $t^2(3 - 2t)$ B. $(3 - 2t)^2$ C. $3 - 2t^2$ D. $9 - (2t)^2$

11. Given that cos (θ) = -0.55, find the value of cos($\theta + 15\pi$).

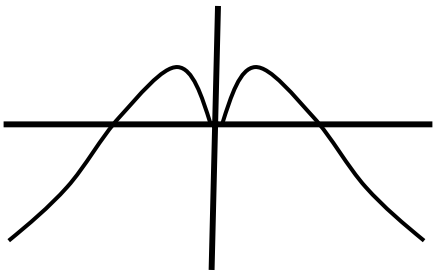
A. -0.55 B. 0.55 C. $-0.55 + 15\pi$ D. insufficient information

12. If the function y = g(x) has the property that g(x) = -g(-x) for all real numbers x, which of the following could be the graph of g(x)?

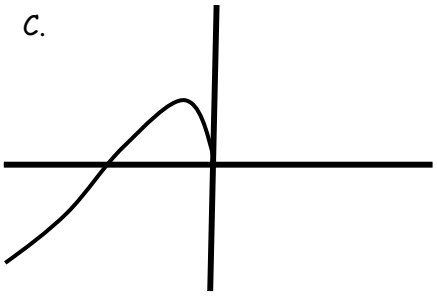
A.



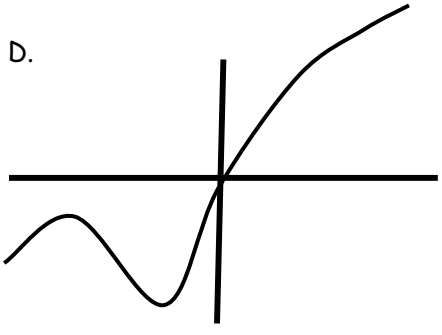
B.



C.



D.



13. How many distinct real-valued solutions would the general quadratic equation $ax^2 + bx + c = 0$ have if you know that ac < 0 ?

A. 0 B. 1 C. 2 D. insufficient information

14. If arcsiny = x, which of the following statements is true?

A. y is an angle that terminates in either quadrant I or quadrant II
B. y is an angle that terminates in either quadrant I or quadrant IV
C. x is an angle that terminates in either quadrant I or quadrant II
D. x is an angle that terminates in either quadrant I or quadrant IV

15. The temperature T (^oC) of a chemical solution at time t (hours) is given by $T(t) = 10 - 0.01t^2$. Find the average rate of change of the temperature from the time t = 4 hours to t = 8 hours.

A. -9.6 ^oC/hr B. 9.6 ^oC/hr C. .12^oC/hr D. -.12 ^oC/hr

16. If the function $f(t) = 10 + \frac{3}{t}$, then $\frac{f(a+h)-f(a)}{h}$ simplifies algebraically to

A. -3 B. $\frac{-3}{a(a+h)}$ C. $\frac{3}{a(a+h)}$ D. $\frac{-3}{h^2}$

17. Evaluate $\log_a\left(\frac{a^{12}a^{150}}{a^4a^{15}}\right)$

A. 13 B. a^{143} C. 143 D. insufficient information

18. Which of the following functions would have a graph with a horizontal asymptote along y = .1 and vertical asymptotes along the lines x = 200 and x = .3.

A. $f(x) = \frac{x}{(x-200)(10x-3)}$ B. $f(x) = \frac{x-0.1}{(x-200)(10x-3)}$

C. $f(x) = \frac{x(x-1)}{(x-200)(10x-3)}$ D. $f(x) = \frac{x(x-1)}{(x+200)(10x+3)}$

19. A particular radioactive substance is characterized by the decay equation $A = A_0 e^{-5t}$, where A_0 is the initial amount of the substance and A is the amount of radioactive material left after t minutes. How long will it take a given amount of the material to decay to one-tenth of its original amount?

A. .02 minutes B. approximately .23 minutes C. approximately .46 minutes
D. Would have to know the specific amount of the material that is initially present to work problem.

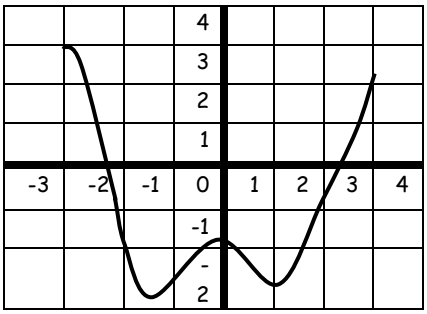
20. Given that y = arctan(x), which of the following is the algebraic expression for sin(y) ?

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

21. Is (x-2) a factor of $3x^6 - 7x^5 + 5x^4 - 6x^3 - 2x^2 + 24x - 40$?

A. yes B. no C. sometimes D. Insufficient information to answer this.

22. The graph of y = f(x) is drawn below. What would be the domain of y = $\sqrt{f(x)}$?



A. [-3,-2] U [2, 3] B. [-3, 3] C. [0, 3] D. [-2, 2]

23. The graph of f(x) = $3x^2 - 4x + C$ will be guaranteed to have no x-intercepts if and only if

A. C > 4/3 B. C < 4/3 C. C > - 4/3 D. This function always has x-intercepts.

24. If θ is an angle that terminates in quadrant II and $\sin\theta = 1/4$, determine the values of $\cos\theta$ and $\csc\theta$.

A. $\cos\theta = \frac{-\sqrt{15}}{4}$ and $\csc\theta = 4$ B. $\cos\theta = \frac{\sqrt{15}}{4}$ and $\csc\theta = 4$

C. $\cos\theta = \frac{\pm\sqrt{15}}{4}$ and $\csc\theta = 4$ D. $\cos\theta = \frac{-\sqrt{15}}{4}$ and $\csc\theta = -4$

25. The velocity (m/sec) of an object at time t (sec) is given by the function $v(t) = \frac{13-2t}{t^2+2}$. At what time(s) will the object's velocity be 1 m/sec? Estimate your answer(s) to the nearest tenth.

A. t = 6.5 sec B. t = 4.5 sec C. t = -4.5, 2.5 sec D. The velocity will never be 1 m/sec

Solutions

1. a
2. d
3. d
4. b
5. a
6. b
7. b
8. d
9. b
10. c
11. b
12. a
13. c
14. d
15. d
16. b
17. c
18. c
19. c
20. c
21. a
22. b
23. a
24. a
25. c