

MATH 141 Spring 2003 Final Exam

Professor _____

Name _____

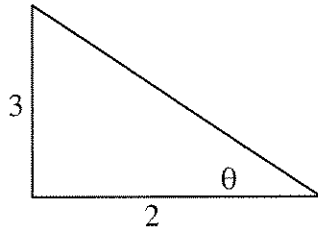
1. What is the terminal point of $t = \frac{16}{3}\pi$ on the unit circle?

- a. $(-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}})$ b. $(-\frac{1}{2}, \frac{\sqrt{3}}{2})$ c. $(-1, 0)$ d. $(-\frac{1}{2}, -\frac{\sqrt{3}}{2})$ e. $(-\frac{\sqrt{3}}{2}, -\frac{1}{2})$

2. Evaluate the expression $\log_2\left(\frac{1}{16}\right)$.

- a. 2 b. -2 c. 4 d. -4 e. 8

3. Find $(\cot \theta)(\sec \theta)$ for the angle θ below:



- a. $\sqrt{13}$ b. $\frac{3+\sqrt{13}}{2}$ c. $\frac{2}{3}$ d. $\frac{\sqrt{13}}{3}$ e. $\frac{2\sqrt{13}}{9}$

4. Find the real zeros of the polynomial $P(x) = 3x^3 - 5x^2 - 8x$.

- a. $0, 1, \frac{-2}{3}$ b. $0, -1, -3$ c. $1, -1, 2$ d. $0, -1, \frac{8}{3}$ e. None of the above.

5. For the function $f(x) = -x^2 + 2x - 4$, find $\frac{f(a+h) - f(a)}{h}$, $h \neq 0$.

- a. $2a - h + 2$ b. $2a + h + 2$ c. $-2a - h + 2$ d. $-2a - 2h + 2$ e. $-2a^2 + h + 2$

6. If the terminal point of the real number t is in quadrant II, which of the following statements are true?

$$I. \tan(t) = \frac{\sqrt{1 - \cos^2(t)}}{\cos(t)} \quad II. \sin(t) = -\sqrt{1 - \cos^2(t)} \quad III. \sin(t) = \frac{1}{\sec(t)}$$

$$IV. \sin(t) = \sqrt{1 - \cos^2(t)} \quad V. \tan(t) = \frac{-\sqrt{1 - \cos^2(t)}}{\cos(t)}$$

- a. all b. I and II c. I and IV d. II and V e. III, IV and V

7. Find the remainder using long division for $\frac{x^3 + 3x^2 + 4x + 3}{x^2 + x - 3}$.

- a. $9+5x$ b. $2x-5$ c. $2+x$ d. $-5x+9$ e. $7x+1$

8. Find the domain of the function $f(x) = \log_7(9 - 3x) - \sqrt{x + 2}$.

- a. $[-2, \infty)$ b. $[-2, 3)$ c. $[-2, -3)$ d. $(-2, 3)$ e. $(-\infty, 3)$

9. Which of the following angles are coterminal?

I. $\frac{14\pi}{3}$

II. 240°

III. -600°

IV. $\frac{-\pi}{3}$

- a. I and II b. I and III c. II and III d. I and IV e. I, II, and IV

10. Find $\text{Im}\left(\frac{1}{i} + \frac{1}{i+1}\right)$

a. $\frac{1}{2}$ b. $\frac{-1}{2}$ c. $\frac{1}{i}$ d. $\frac{3}{2}$ e. $\frac{-3}{2}$

11. Solve the inequality $|5x - 2| \leq 6$.

a. $\left[0, \frac{8}{5}\right]$ b. $\left(-\infty, -\frac{4}{5}\right]$ c. $\left[-\frac{4}{5}, -\frac{8}{5}\right]$ d. $\left(-\frac{4}{5}, \frac{4}{5}\right)$ e. None of the above

12. Find the domain and range of the function $f(x) = \sqrt{2-x}$.

- a) Domain $[-2, 2]$, Range $[0, \infty)$
- b) Domain $[-\infty, 2]$, Range $[3, \infty)$
- c) Domain $[-\infty, 2]$, Range $[0, \infty)$
- d) Domain $(-\infty, 2]$, Range $[0, 3)$
- e) Domain $[4, 6]$, Range $[0, \infty)$

13. Find a polynomial with degree 3 and zeros 1 and $2i$.

- a. $x^3 - x^2 + 4x - 4$
- b. $x^3 + 2x^2 - 4x - 4$
- c. $3x^3 + 8x^2 + 4x - 2$
- d. $x^3 + x - 4$
- e. None of the above

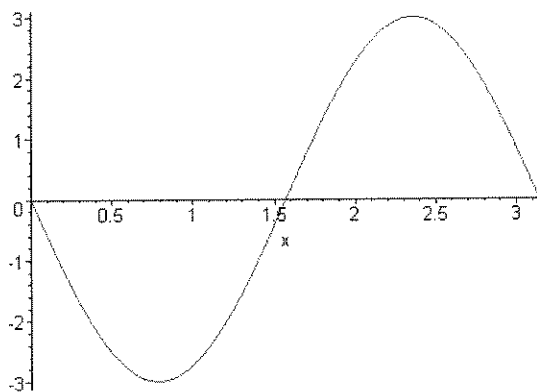
14. Find the equation of the line perpendicular to $y = -\frac{1}{3}x + 2$, through the point $(1, -2)$.

- a. $y = -3x + 4$ b. $y = 3x - 5$ c. $y = -\frac{1}{3}x + 1$ d. $y = \frac{1}{3}x + 12$ e. None of the above

15. Find the vertical asymptotes of the function $f(x) = \frac{2x(x-1)}{x^2 - 5x - 14}$.

- a. $x = 7$ and $x = -2$
- b. $x = 1$ and $x = 0$
- c. $y = 2$
- d. $x = 2$ and $x = 1$
- e. None of the above

16. Which of the following functions best describes the graph of the function shown here?



- a. $f(x) = 3\sin(x)$
- b. $f(x) = -3\sin\left(\frac{1}{2}x\right)$
- c. $f(x) = 3\sin\left(\frac{1}{2}x\right)$
- d. $f(x) = -3\sin(2x)$
- e. $f(x) = 3\sin(2x)$

17. Use the Laws of Logarithms to rewrite $\log_a \sqrt{\frac{x}{y^3 z^2}}$ in a form with no logarithms of products, quotients, or powers.

- a. $\frac{1}{2}\log_a x - \frac{3}{2}\log_a y - \log_a z$
- b. $\frac{1}{2}\log_a x - \frac{3}{2}\log_a y + \log_a z$
- c. $\frac{3}{2}\log_a x - \frac{2}{3}(\log_a y + \log_a z)$
- d. $\frac{1}{2}\log_a x - \frac{1}{2}\log_a y^3 z^2$
- e. $\log_a x - 3\log_a y - 2\log_a z$

18. What is the value of $\tan \theta$ if $\csc \theta = 3$ in quadrant II?

- a. $\frac{-\sqrt{2}}{4}$ b. $\frac{-2\sqrt{2}}{3}$ c. $\frac{\sqrt{3}}{2}$ d. $-\sqrt{3}$ e. $2\sqrt{2}$

19. Find a function whose graph is the line segment joining the points (0,5) and (3,11).

- a. $f(x) = 2x + 5$ b. $f(x) = -2x + 5$ c. $f(x) = 2x - 5$
 d. $f(x) = \frac{2}{5}x - 5$ e. $f(x) = \frac{2}{5}x + \frac{1}{5}$

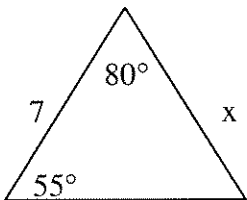
20. Find the period of $f(x) = 2 \tan(4\pi(x - 2))$

- a. π b. $\frac{1}{4}$ c. $\frac{1}{2}$ d. $\frac{\pi}{4}$ e. $\frac{\pi}{2}$

21. Evaluate the expression $\log_{12} 3 + \log_{12} 48$.

- a. 1 b. 2 c. 3 d. 4 e. 5

22. Find the length of x :



- a. $14\sqrt{2} \sin(55^\circ)$ b. $\frac{7}{2 \cos(80^\circ)}$ c. $7\sqrt{2} \sin(80^\circ)$ d. $\frac{7\sqrt{2}}{2 \cos(55^\circ)}$ e. $7\sqrt{2} \sin(55^\circ)$

23. Given $f(x) = 2x^2 + 1$ and $g(x) = x - 2$, find $(f \circ g)(x)$.

- a. $2x^2 - 8x + 9$ b. $2x^2 + 9x + 8$ c. $2x^2 + 8x - 9$ d. $2x^2 - 8x - 9$ e. $-2x^2 - 8x + 9$

24. Find the period and the phase shift of $y = \sin\left(\frac{3}{4}(2x + \pi)\right)$

a. The period is $\frac{8}{3}\pi$ and the phase shift is $-\pi$

b. The period is $\frac{3}{2}\pi$ and the phase shift is $-\pi$

c. The period is $\frac{4\pi}{3}$ and the phase shift is $-\frac{\pi}{2}$

d. The period is $\frac{4\pi}{3}$ and the phase shift is $-\pi$

25. Rewrite $\ln(2a + b) - \ln(a - b) + 3 \ln c$ as a single logarithm.

a. $\ln\frac{(2a+b)}{c^3(a-b)}$ b. $\ln\frac{(2a+b)}{3c(a-b)}$ c. $\ln\frac{c^3(2a-b)}{(a-b)}$

d. $\ln\frac{c^3(2a+b)}{(a+b)}$ e. $\ln\frac{c^3(2a+b)}{(a-b)}$

26. Find the largest angle in a triangle whose sides are the lengths 3, 5 and 7 inches.

a. 30° b. 45° c. 60° d. 120° e. 135°

27. Find the inverse function of $f(x) = 2 - x^5$

a. $f^{-1}(x) = 2 - \sqrt[5]{y}$ b. $f^{-1}(x) = 2 + \sqrt[5]{y}$ c. $f^{-1}(x) = \sqrt[5]{y} + 2$

d. $f^{-1}(x) = \sqrt[5]{2-y}$ e. $f^{-1}(x) = \sqrt[5]{-2-y}$

28. Evaluate the given expression: $(\tan(-\frac{\pi}{4}))(\sin(-\frac{\pi}{3}))^2 + \cos(-\frac{\pi}{3})$

a. $\frac{5}{4}$ b. $\frac{2}{\sqrt{3}} - \frac{1}{2}$ c. $-\frac{1}{4}$ d. $\frac{\pi}{2}$ e. 0

29. Find the solution of the equation $e^{1-3x} = 7$.

a. $\frac{1}{3}(1 - \ln 7)$ b. -2 c. $1 - \ln 3$ d. $\ln 1 - 3$ e. None of these above

30. What is the length of each side in an equilateral triangle with height $3\sqrt{3}$?

- a. 3 b. $6\sqrt{3}$ c. 6 d. $3\sqrt{3}$ e. 2

31. Given the graph of f , describe how the graph of $y=3f(x+1)$ can be obtained from the graph of f .

- a. By shifting 1 unit to the right, then shrinking vertically by a factor of 3.
b. By shifting 1 unit to the left, then shrinking vertically by a factor of 3.
c. By shifting 1 unit to the right, then stretching vertically by a factor of 3.
d. By shifting 1 unit to the left, then stretching vertically by a factor of 3.
e. By shifting 1 unit upward, then stretching vertically by a factor of 3.

32. Solve the equation $2 \log x = \log 4 + \log (3 - x)$ for x .

- a. 2 b. -6 c. 2 and -6 d. $\frac{3}{2}$ e. $-\frac{3}{2}$