Final Exam

Math 1103, Fall 2012

1. Find the slope and y-intercept of the line that is parallel to $2x + 3y = 5$ and passes through the point $(1, -1)$

   a. $Slope = \frac{2}{3}; y - intercept = \frac{5}{3}$

   b. $Slope = -\frac{2}{3}; y - intercept = \frac{1}{3}$

   c. $Slope = -\frac{2}{3}; y - intercept = -\frac{1}{3}$

   d. $Slope = -\frac{2}{3}; y - intercept = \frac{5}{3}$

   e. None of the above

2. Find the domain of the function $f(x) = \frac{1}{x^2+x-2}$
   a. $(-\infty, \infty)$
   b. $x \neq 1$
   c. $x \neq -2$
   d. $x \neq 2, -1$
   e. $x \neq -2,1$

3. If the point $(-2,1)$ is on the graph of $f(x)$ and $f(x)$ is known to be odd, what other point must be on the graph of $f(x)$

   a. $(-2, -1)$
   b. $(2, -1)$
   c. $(-2,1)$
   d. $(1, -1)$
   e. $(0, -1)$

4. Find the value of $f(2) - f(0)$, if

$$f(x) = \begin{cases} 2 - x, & x < 1 \\ x^2 - x + 1, & x \geq 1 \end{cases}$$

   a. 3
   b. -1
   c. 2
   d. 0
   e. 1

5. If $f(x) = \frac{1}{x} + 1$ and $g(x) = \frac{1}{x} - 1$, find $(fg)(x)$.

   a. $\frac{1}{x^2} - 1$

   b. 1

   c. $1 - x$

   d. $\frac{1}{1-x}$

   e. 0

6. The length of a rectangle is 5 units longer than twice its width. Assuming that the width of the rectangle is *w* and the area is *A*, find the area as a function of the width.
   a. $A(w) = w^2 + 5w$
   b. $A(w) = 2w^2 + 5$
   c. $A(w) = 2w^2 - 5w$
   d. $A(w) = 2w^2 + 5w$
   e. None of the above

7. 1000 dollars grows to 1 million dollars after 60 years in a bank. If interest is compounded continuously, what is the rate of interest per year?

   a. 1.83%
   b. 11.51%
   c. 28.13%
   d. 3.84%
   e. 0.12%

8. Find the sum of all the zeros of the polynomial $f(x) = x^3 + 2x^2 - 5x - 6$

   a. -5

   b. -2

   c. 0

   d. 2

   e. 6

9. The graph of $y = (x-4)^2 + 5$ can be obtained by the transformation of $g(x) = x^2$. Which of the following transformations must be used?

   I. Move 5 units down.
   II. Move 5 units up.
   III. Move 4 units down.
   IV. Move 4 units left
   V. Move 4 units right.

   a. V, then II
   b. IV, then II
   c. III, then I
   d. II, then III
   e. III, then II

10. Which of the following functions represents the inverse of the function $f(x) = 3e^x$.
    a. $f(x) = 3e^{-x}$
    b. $f(x) = \frac{1}{3e^x}$
    c. $f(x) = \ln\left(\frac{x}{3}\right)$
    d. $f(x) = \frac{1}{3}\ln(x)$
    e. $f(x) = \log\left(\frac{x}{3}\right)$

11. The vertex of the parabola $f(x) = 2x^2 - 4x + 7$ is
    a. $(-1, 13)$
    b. $(1, 7)$
    c. $(2, 5)$
    d. $(-1, 5)$
    e. $(1, 5)$

12. Find the horizontal asymptote (HA) and vertical asymptote (VA) of

$$f(x) = \frac{x^2 - 4}{x(x+2)}$$

    a. HA: $y = 1$ VA: $x = 0, x = -2$

    b. HA: $y = 0$ VA: $x = 0, x = -2$

    c. HA: $y = 1$ VA: $x = 0$

    d. HA: $y = 0$ VA: $x = 0$

    e. HA: None VA: $x = 0, x = -2$

13. Find the oblique asymptote of

$$f(x) = \frac{x^2 + 1}{x - 1}$$

a. $y = 1$
b. $y = x - 1$
c. $y = x^2 + 1$
d. $y = x + 1$
e. $y = 0$

14. If $f(x) = \frac{1}{x}$ and $g(x) = 1 - \frac{1}{x}$, find $(g \circ f)(x)$

a. 1
b. $1 - x$
c. $-1 + \frac{1}{x^2}$
d. $\frac{1}{x} - \frac{1}{x^2}$
e. 0

15. What are all the possible rational roots of $f(x) = 6x^4 - x^3 - 4x^2 - x - 2$?

a. $\pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{2}, \pm \frac{3}{2}$
b. $\pm 1, \pm 2, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{1}{6}$
c. $-\frac{2}{3}, \frac{3}{2}$
d. $-1, \frac{3}{2}$
e. None of the above

16. Which of the following intervals represents the solution set to the inequality $\frac{x-1}{x+4} > 3$

a. $(-4, \infty)$
b. $\left(-\infty, -\frac{13}{2}\right)$
c. $\left(-\frac{13}{2}, -4\right)$
d. $(-4,1)$
e. $(-\infty, 3)]$

17. Which of the following statements are true?

I. $(\ln x)^2 = 2 \ln x$
II. $\log_4(3x^4) = 4 \log_4(3x)$
III. $\log(x - y) = \frac{\log x}{\log y}$
IV. $\log_3 \frac{9}{4} = 2 - \log_3 4$
V. $\ln(x^2) = 2 \ln x$

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

18. Solve $log(x - 1) + log(x + 1) = 0$

a. $x = \sqrt{2}$
b. $x = -1, x = 1$
c. $x = 1$
d. $x = -\sqrt{2}, x = \sqrt{2}$
e. $x = 2$

19. Solve the equation $2^{x+2} = 16^{x}$

a. $x = 0$
b. $x = 1$
c. $x = 2$
d. $x = 3$
e. $x = \frac{2}{3}$

20. Convert the equation $3^{-2} = \frac{1}{9}$ to logarithmic form

a. $\log_3(\frac{1}{9}) = -2$
b. $\log_3(-2) = \frac{1}{9}$
c. $\log_{-2}(\frac{1}{9}) = 3$
d. $\log_{\frac{1}{9}}(3) = -2$
e. $\log_{\frac{1}{9}}(-2) = 3$

21. Find the range of the function $f(x) = 5\sin[2(x + \frac{\pi}{3})] - 4$

a. $[-1,1]$
b. $[-\frac{\pi}{3}, \frac{\pi}{3}]$
c. $[-1,9]$
d. $[-9,1]$
e. None of the above.

22. Suppose that $\sin\theta = \frac{2}{5}$ and θ is in Quadrant 2. Evaluate $\cos\theta$

a. $\frac{-2}{\sqrt{29}}$

b. $\frac{5}{\sqrt{21}}$

c. $-\frac{\sqrt{21}}{5}$

d. $\frac{\sqrt{29}}{2}$

e. $\frac{\sqrt{21}}{5}$

23. Find the quadrant in which the terminal side of $\theta = 4\ radians$ is located

a. One
b. Two
c. Three
d. Four
e. None of the above.

24. Find $\frac{f(2+h)-f(2)}{h}$ if $f(x) = x^2 + 2x - 1$

a. $h + 6$
b. 2
c. $2 + h$
d. $h^2 + 2h - 1$
e. 1

25. Find the exact value of $cot^{-1}(-1)$.

a. $-\frac{\pi}{4}$

b. $\frac{\pi}{4}$

c. $\frac{3\pi}{4}$

d. $-\frac{3\pi}{4}$

e. None of the above.

26. Find the inverse of the function $f(x) = \sin(\frac{x}{5})$, where $-\frac{5}{2}\pi \leq x \leq \frac{5}{2}\pi$,

a. $f^{-1}(x) = \frac{1}{\sin(5x)}$

b. $f^{-1}(x) = \csc(5x)$

c. $f^{-1}(x) = \frac{1}{5}\sin^{-1}(x)$

d. $f^{-1}(x) = 5\sin^{-1}(x)$

e. $f^{-1}(x) = \sin^{-1}(\frac{1}{5x})$

27. By using sum or difference formulas, $\cos(\frac{\pi}{2} - x)$ can be written as

a. $-\cos x$

b. $\sin x$

c. $\cos x$

d. $-\sin x$

e. None of the above

28. Which of the following is an expression for $\cos(2\alpha)$
    a. $1 + 2\cos^2(\alpha)$
    b. $-1 + 2\cos^2(\alpha)$
    c. $1 - \cos^2(\alpha)$
    d. $-1 - \cos^2(\alpha)$
    e. $2\cos(\alpha)$

29. A 41 meter guy wire is attached to the top of a 34.6 meter antenna and to a point on the ground. What angle, in degrees, does the guy wire make with the ground?

    a. $1°$
    b. $57.55°$
    c. $37.65°$
    d. $45°$
    e. None of the above.

30. Find an angle θ between $0°$ and $360°$ that is coterminal with $-790°$
    a. $\theta = 90°$
    b. $\theta = 70°$
    c. $\theta = -70°$
    d. $\theta = 290°$
    e. None of the above

31. The general solution of the equation $\cos(2\theta) = 1$ is

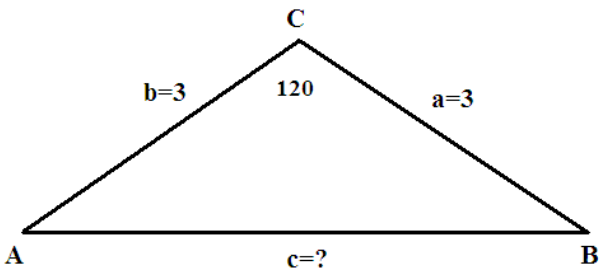
a. $k\pi$, where k is an integer
b. 0
c. $2k\pi$, where k is an integer
d. $\frac{\pi}{2} + 2k\pi$, where k is an integer
e. $\frac{3\pi}{2} + 2k\pi$, where k is an integer

32. Simplify

$$\sec x - \sec x \ . \sin^2 x$$

a. 1
b. $\sec x$
c. $\sin^2 x$
d. $\cos^2 x$
e. $\cos x$

33. Find the length of the side c in the triangle ABC where $a = 3, b = 3$ and $\angle ACB = 120°$



(Note the figure is not drawn to scale)

a. $\sqrt{27}$
b. 27
c. $\sqrt{18 - 9\sqrt{3}}$
d. $\sqrt{18 + 9\sqrt{3}}$
e. $\sqrt{10}$

34. For what values of x in the interval $[-2\pi, 2\pi]$ does the graph of $y = \cot(2x)$ have a vertical asymptote? (Angles are measured in radians)

a. $-2, -1, 0, 1, 2$

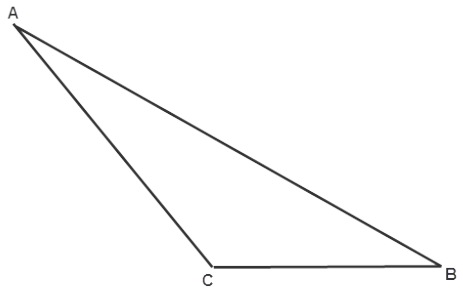
b. $-2\pi, -\frac{3\pi}{2}, -\pi, -\frac{\pi}{2}, 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$

c. $-2\pi, -\pi, 0, \pi, 2\pi$

d. $-\frac{3\pi}{2}, \frac{3\pi}{2}$

e. $-2\pi, 0, 2\pi$

35. In the figure below, $\angle C = 125°$, $AB = 8.6\ inches$, and $AC = 5.7\ inches$. Find $\angle B$ in degrees.



(Note the figure is not drawn to scale)

a. $\angle B = 29.8°$
b. $\angle B = 32.9°$
c. $\angle B = 35.7°$
d. $\angle B = 38.2°$
e. $\angle B = 30.6°$