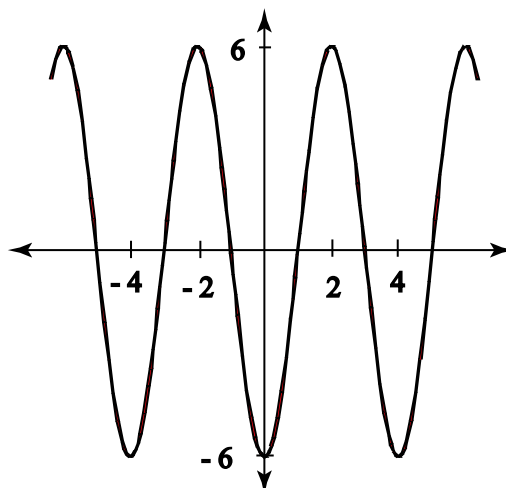


Math 112 Review for the Final Exam

1. How many triangle(s)  $ABC$  have  $A = 150^\circ$ ,  $a = 5$ , and  $b = 5\sqrt{3}$ ?  
[You must justify your answer to receive credit]
2. Prove the following identity.  $\sin^4 x + \tan^2 x \cos^4 x = \cot x \tan x - \cos^2 x$
3. Ben is flying a kite. The angle of elevation from Ben's eye level to the kite is  $45^\circ$ . Ben's eyes are 6 feet above the ground and 30 feet from the kite. How high is the kite flying?
4. Two straight paths meet in Town A at an angle of  $60^\circ$ . One path leads to Town B and the other leads to Town C. If Town B is 10 miles from Town A, and Town C is 8 miles from Town A, how far is Town B from Town C?
5. Find the exact value of  $\sin(2x)$  given that  $\cos x = \frac{\sqrt{5}}{4}$  and  $-\pi < x < 0$ .
6. Find all the exact values of  $\cos(x - \pi/6)$  given that  $\sin x = 1/3$  and  $0 < x < \pi/2$ .
7. If the point  $(7, -13)$  is a point on the terminal side of an angle  $\theta$ , then what are the exact values of  $\cos \theta$  and  $\csc \theta$ ?
8.  $\sin(14x) =$ 
  - (a)  $14 \sin(x)$
  - (b)  $\sin(7x) + \sin(7x)$
  - (c)  $1 - \cos(14x)$
  - (d)  $2 \sin(7x) \cos(7x)$
9.  $\cos^2(-x) + \sin^2(-x) =$ 
  - (a) 1
  - (b)  $\cos(2x)$
  - (c)  $\sin^2(x) - \cos^2(x)$
  - (d) -1
10. What are all the solutions of the equation  $\tan x \cos x = \frac{\sqrt{3}}{2} \tan x$  where  $0 \leq x \leq \pi$
11. Find all the exact solutions to  $\sec^2 x - 2 \tan^2 x = 0$
12. Suppose the end of a minute hand on a clock is travelling at  $180\pi$  feet per second. How long is the minute hand?
13. State the period and amplitude of the graph of the function  $f$  whose rule is
$$f(x) = -14 \cos(\pi x + 3)$$
14. Find the rule of  $f^{-1}$  where  $f(x) = 245 \ln(12x + 3)$ .

15. State the rule of the function whose graph is given below:



16. Find all roots of the polynomial

$$f(x) = x^3 + x^2 - 15x + 25$$

given that  $f(2 - i) = 0$ .

17. Solve for  $x$ .

$$x^7 = 1$$

18. Write the following complex number in both standard form and polar form

$$(\sqrt{3} + i)^3$$

19. Find the rule of  $f^{-1}$  where

$$f(x) = 13 \cdot 3^{\frac{1}{2}x+12}$$

20. Solve for  $x$ .

$$x^4 + x^3 = -x^2 - x - 1$$

21. Sketch a graph of the function  $f$  whose rule is  $f(x) = -12 \cos(x - \pi)$

22. Find the following values

(a)  $\arcsin\left(-\frac{1}{2}\right)$

(b)  $\arctan(-1)$

(c)  $\arccos(\sin(\pi/3))$

(d)  $\cos(\arccos(1/2))$

(e)  $\tan(\arcsin(\sqrt{3}/2))$

23. Prove the following identity:

$$\frac{1 - \sin^2 x}{\sin^2 x} = \frac{\csc^2 x - 1}{\cos(2x) + 2 \sin^2 x}$$

24. Find the exact value of  $\sin\left(-\frac{5\pi}{12}\right)$

[Hint:  $-\frac{5\pi}{12} = \frac{3\pi}{12} - \frac{8\pi}{12}$  ]