Final Exam (Non-technology Section)
MATH 117 – 750 & -VU1 Name
No graphing calculators or computers are allowed on this section of the exam. Show all of your work and adequately explain your steps to receive full credit. Good luck!

1) (12 pts. each) Find the exact values of the sine, cosine, tangent, and cotangent (if they exist) of the following angles by drawing the appropriate reference triangles on coordinate axes.

a)
θ=120°
sinθ =
cosθ =
tanθ =
cotθ =
secθ =
cscθ =

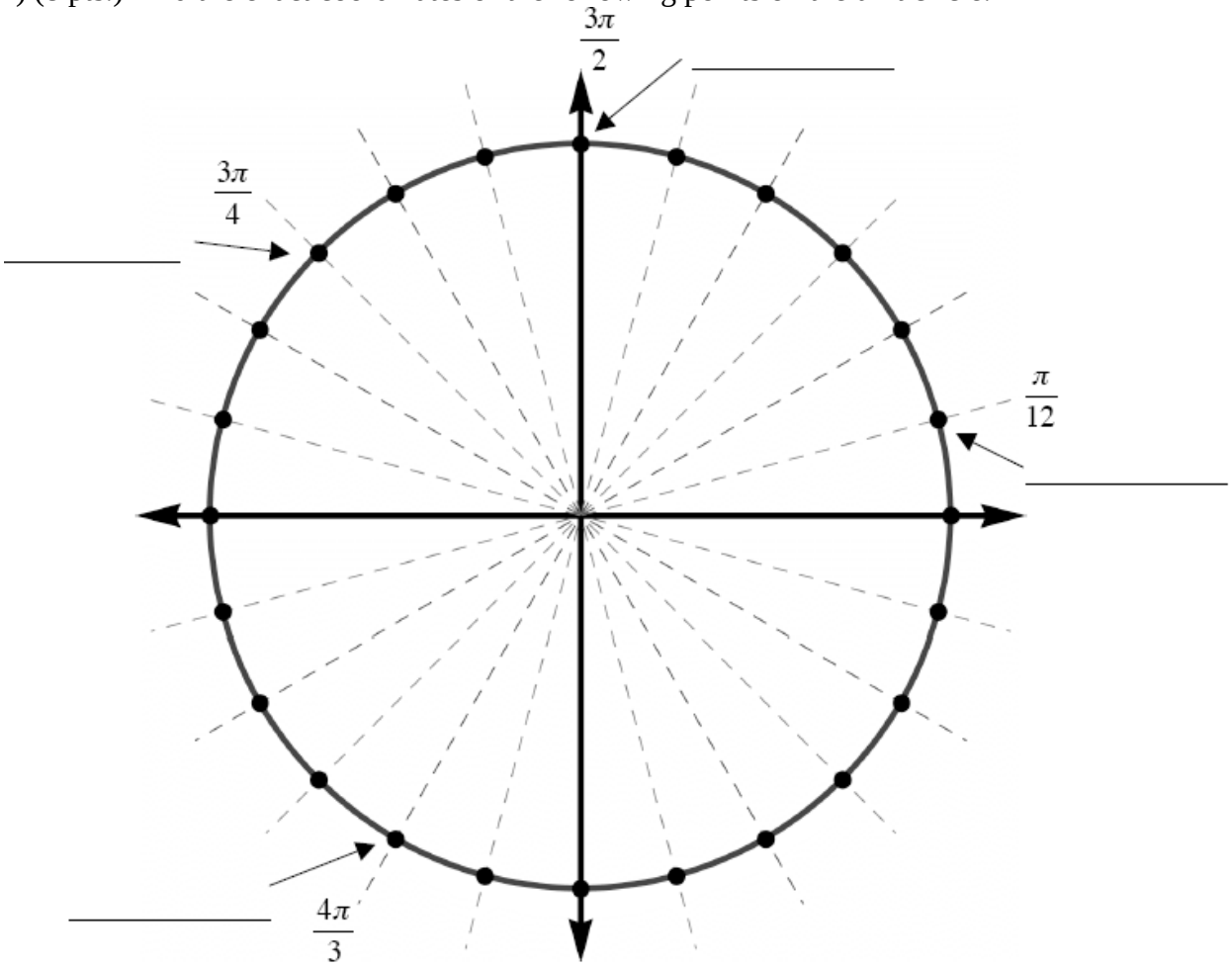
b)
θ = -90°
sinθ =
cosθ =
tanθ =
cotθ =
secθ =
cscθ =

2) (6 pts.) Find the exact value of $\cos\left(\frac{7\pi}{12}\right)$ using the difference formula for cosine, and the fact that

$$\frac{7\pi}{12} = \frac{3\pi}{4} - \frac{\pi}{6}$$

3) (6 pts.) Find the amplitude and period of $f(\theta) = 4\sin(3\theta)$.

4) (8 pts.) Find the exact coordinates of the following points on the unit circle.



5) (7 pts.) Find the exact value of $\sin\left(\frac{3\pi}{2}\right)$ using the double-angle identity for sine, and the fact that $\frac{3\pi}{2} = 2\left(\frac{3\pi}{4}\right)$

6) (7 pts.) Find the exact value of $\cos\left(-\frac{\pi}{4}\right)$ using the half-angle identity for cosine, and the fact that $-\frac{\pi}{4} = \frac{1}{2}\left(-\frac{\pi}{2}\right)$.

7) (4 pts. each) Perform the following operations on the complex numbers.
a) (3- i) - (2 + 4i)

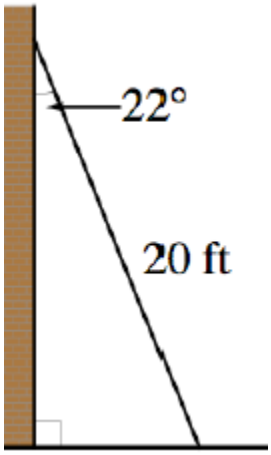
b)

$$\frac{2+i}{2-i}$$

8) (6 pts.) Use DeMoivre's Formula to calculate $\left(1+\sqrt{3}i\right)^5$. Put your answer back into rectangular form.

9) (8 pts.) Find all complex solutions of the equation $x^4 = -i$

Final Exam (Regular Section)
MATH 117 – 750 & -VU1 Name
A graphing calculator or computer with blank *Mathematica* file is allowed on this section of the exam. Show all of your work and adequately explain your steps to receive full credit. Good luck!
10) (5 pts. each) A ladder 20 feet long leans against the side of a building. The angle between the ladder and the building is 22°.



a) Find the angle between the bottom of the ladder and the ground.

b) Find the distance (rounded to tenths) from the bottom of the ladder to the building.

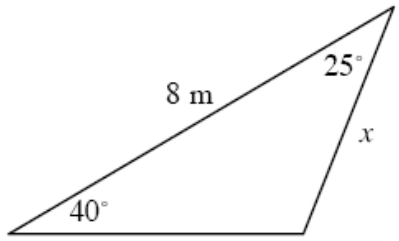
Suppose in parts c), d), and e) below that the bottom of the ladder is pulled 3 feet farther away from the building.

c) Illustrate this new situation, putting known lengths and angles in your diagram.

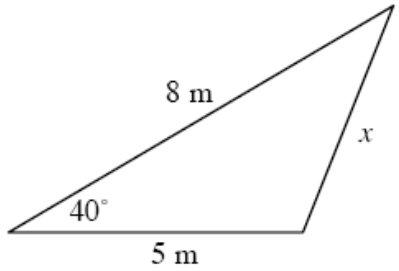
d) How far above the ground is the top of the ladder now? Round your answer to tenths.

e) What is the new angle between the bottom of the ladder and the ground? Round your answer to tenths.

11) (7 pts.) Use the Law of Sines to calculate the length *x* in the following diagram, rounded to two decimal places.



12) (7 pts.) Use the Law of Cosines to calculate the length *x* in the following diagram, rounded to two decimal places.



13) (4 pts.) Convert $\frac{7\pi}{20}$ radians to degrees.

14) (4 pts.) Convert 96° degrees to radians.

15) (8 pts.) Suppose that you have a motor that has enough power to turn two 8-inch diameter wheels on a pitching machine at 3000 rpm. How fast can the machine "pitch" a ball, in mph, rounded to two decimal places?

16) (15 pts.) A projectile is to be fired from a height of 5 ft at 32 ft/s. At what angles θ in degrees above horizontal can it be fired to hit a target 16 ft away at a height of 1 ft, rounded to two decimal places?