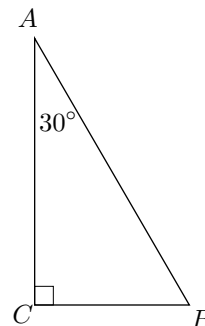
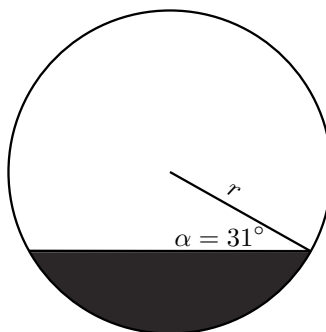


Trigonometry Exam

1. [2 pts] In the right triangle shown, $\overline{AB} = 5$ cm. Find the exact length of \overline{AC} .

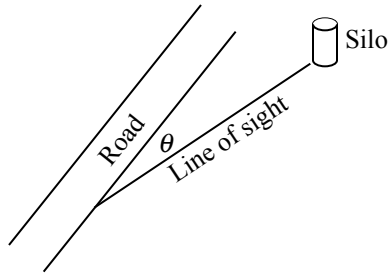


2. [2 pts] Find the exact value of $\cos \frac{11\pi}{12}$.
3. [4 pts] Let θ is an angle in Quadrant II. Suppose $\tan \theta = -\frac{4}{7}$. Find the exact values of $\sin \theta$ and $\cos \theta$.
4. [5 pts] Suppose $\alpha = 31^\circ$. Find the radius r so that the area of the shaded region is precisely 10 square units. Round your answer to the nearest tenth of a unit.

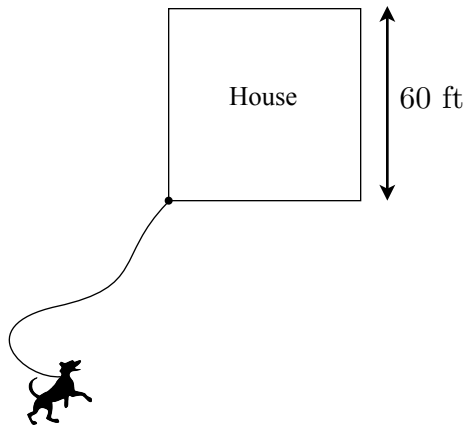


5. [4 pts] Let $\vec{V} = \langle 2, -5 \rangle$ and $\vec{W} = \langle 1, 3 \rangle$.
- Find $2\vec{V} - 3\vec{W}$.
 - Find $-3\vec{V} + \frac{1}{2}\vec{W}$.
6. [3 pts] Find all solutions of θ within the interval $[0, 2\pi)$:
- $$2 \cos \theta - 1 = 0$$
7. [4 pts] Let α be an angle in Quadrant IV and β be an angle in Quadrant II. Suppose that $\sin \alpha = -\frac{3}{5}$ and $\sin \beta = \frac{12}{13}$. Find: $\sin(\alpha - \beta)$.
8. [3 pts] Let $z = \frac{\sqrt{3}}{2} + \frac{1}{2}i$. Find z^7 . Write the answer in standard form: $a + bi$.

9. [5 pts] While sitting in a car that is traveling on a straight road, you see a grain silo in a distant field. You measure the angle between your line of sight and the straight road and find it to be 31 degrees. About 800 yards down the road, you notice that the grain silo is now closer. Again, you measure the angle induced by your line of sight and the straight road and find it to be 86 degrees. How far away was the silo when you made your first measurement?



10. [3 pts] Find the area of the triangle whose sides are 4 cm, 7 cm, and 8 cm.
11. [5 pts] A guard dog is leashed on the corner of a house with a 60 feet by 60 feet square footprint. The leash is 130 feet long. Assuming that there are no fences or other barriers, other than the walls of the house, find the total amount of area the dog can guard. (Note: The dog isn't allowed inside the house.)



College Algebra Exam [4 pts each]

12. Find the domain of the function $f(x) = \sqrt{x^2 - 5x - 6}$.

13. Suppose $\ln a = 5$ and $\ln b = 8$. Find $\ln \frac{a^2}{\sqrt{b}}$

14. Find all solutions to the equation:

$$x^{2/3} + 4x^{1/3} + 3 = 0$$

15. Let $f(x) = \frac{2x - 1}{3x + 2}$. Find $f^{-1}(x)$.

16. Construct a polynomial with real coefficients that satisfies the following conditions:

1. Its degree is 3, with leading coefficient 1.
2. $x = 2$ is a zero.
3. $x = 1 + i$ is a zero.

17. Find the sum of the first 200 positive numbers.

18. Find the equation, in slope-intercept form, of the line that goes through the point $(-1, 2)$ and is perpendicular to $y = \frac{2}{3}x - 1$.

19. Evaluate the determinant of the matrix:

$$\begin{pmatrix} 2 & 0 & -1 \\ 0 & 1 & -3 \\ 8 & -2 & 4 \end{pmatrix}$$

20. Solve the following inequality:

$$3x^2 - 14x + 5 \geq 0$$

21. On the basis of data collected during an experiment, a biologist found that the growth of a fruit fly with a limited food supply could be approximated by the logistic model

$$N(t) = \frac{400}{1 + 39e^{-0.16t}}$$

where t denotes the number of days since the beginning of the experiment.

- What was the initial fruit fly population in the experiment?
- What was the maximum fruit fly population that could be expected under this laboratory condition?
- On what day will the population reach 200 fruit flies? (Round to the nearest day)

1. $\overline{AC} = \frac{5\sqrt{3}}{2}$
2. $\cos \frac{11\pi}{12} = \frac{-\sqrt{2} - \sqrt{6}}{4}$ or $-\frac{\sqrt{2} + \sqrt{6}}{4}$
3. $\sin \theta = \frac{4\sqrt{65}}{65}$ $\cos \theta = -\frac{7\sqrt{65}}{65}$
4. $r \approx 4.1$ units \pm round off error.
5.
 - (a) $2V - 3W = \langle 1, -19 \rangle$
 - (b) $-3V + \frac{1}{2}W = \langle -\frac{11}{2}, \frac{33}{2} \rangle$
6. $\theta = \frac{\pi}{3}, \frac{5\pi}{3}$; or $60^\circ, 300^\circ$
7. $\sin(\alpha - \beta) = -\frac{63}{65}$
8. $z^7 = -\frac{\sqrt{3}}{2} - \frac{1}{2}i$
9. 895.674 yards \pm round off error.
10. Area ≈ 13.998 \pm round off error.
11. Area ≈ 47420.914 ft² \pm round off error.
12. $(-\infty, -1] \cup [6, \infty)$
13. $\ln \frac{a^2}{\sqrt{b}} = 6$
14. $x = -1, -27$
15. $f^{-1}(x) = \frac{2x+1}{2-3x}$ or $\frac{-2x-1}{3x-2}$
16. $f(x) = x^3 - 4x^2 + 6x - 4$
17. $\sum_{n=1}^{200} n = 20100$
18. $y = -\frac{3}{2}x + \frac{1}{2}$
19. $D = 4$
20. $\left(-\infty, \frac{7 - \sqrt{34}}{3}\right] \cup \left[\frac{7 + \sqrt{34}}{3}, \infty\right)$
21.
 - (a) 10
 - (b) 400
 - (c) 23 days

Exam 1C – Chemistry (2 points/question)

1. How many grams of CO_2 will exert a pressure of 327 mmHg in a 6.75L container at 87° ?
2. Report the answers to the proper number of significant figures.
 - a. $(3.123 + 1.4) \times (4.16) =$
 - b. $(158.2) \times (0.028 + 0.133) =$
 - c. $(0.0238 - 0.0138) \times (14.8) =$
3. How many tons of an iron ore, containing 43% iron by mass, are needed to provide 3.68 tons of iron?
4. How many molecules are there in 4.00g of O_2 ? How many moles of O_2 ?
5. A gas exerts a pressure of 250 mmHg in a 125ml container at 150°C . What pressure will the same gas exert in a 50ml container at 50°C ?
6. For the following ion, what is the number of:

34	2-	Protons = _____
S		Neutrons = _____
16		Electrons = _____
7. A compound with an empirical formula of B_5H_4 has a gas density of 3.60g/l at 225°C and 0.634 atm. Determine its molecular formula.

8. According to the equation: $2\text{B}_2\text{O}_3 + 6\text{C} \rightleftharpoons \text{B}_4\text{C}_3 + 3\text{CO}_2$
- How many moles of B_2O_3 must react to produce 1.45 moles of CO_2 ?
 - How many grams of carbon are required to react with 43.2g of B_2O_3 ?
 - How many molecules of CO_2 are produced by the reaction in 'b' above?
9. What mass of K_2SO_4 must be dissolved and diluted to 350 mL with H_2O to yield a $[\text{K}^+] = 1.25 \times 10^{-1} \text{ M}$?
10. List the species in a sequence of steadily increasing energy required to remove one electron (from the smallest to the largest).
- C, C^+ , N, Ne
 - F, Cl, As, P
 - Rb, Na, Li, Cs
11. Write the molecular geometry and bond angles for the species given.
- ClO_3^-
 - NO_2^+
 - BO_2^{3-}