

Technical Mathematics II

Homework Problems

Instructions

- Each assignment is to be done on regular-sized notebook paper.
- Your name and the assignment number should appear at the top of the first sheet.
- Please do not use a red pen or red pencil to do the homework.
- All relevant work is **required**. Failure to show relevant work will result in a large point deduction.

Graded Homework 1

1. Sketch the graph of the line passing through $(-3, 7)$ with slope $-8/7$. Do not find any equation of this line.
2. Sketch the graph of the line passing through $(1, -5)$ with slope 8. Do not find any equation of this line.
3. Find the slope-intercept form of the line passing through $(7, -3)$ with slope -4 .
4. Find the slope-intercept form of the line passing through $(-4, -2)$ with slope $5/6$.
5. Find the slope-intercept form of the line passing through $(-5, 1)$ and $(7, -2)$.
6. Find the slope-intercept form of the line passing through $(6, 8/3)$ and $(-1/2, -3)$.
7. Find a general form of the line $y = 5x - 3$. The coefficients of the general form must be integers.
8. Find a general form of the line $y = -\frac{4}{5}x + \frac{7}{8}$. The coefficients of the general form must be integers.
9. Find the slope and the y -intercept of the line $4x - y + 9 = 0$.
10. Find the slope and the y -intercept of the line $8x - 7y + 3 = 0$.
11. What is the equation of the vertical line which passes through $(-6, 8)$?
12. What is the equation of the horizontal line which passes through $(-17, -5)$?
13. Sketch the graph of the line $y = -\frac{5}{4}$.
14. Sketch the graph of the line $x = 5$.
2. Determine if the following lines are parallel, perpendicular, identical, or none of the three.
$$6x - 10y - 35 = 0 \text{ and } 40x + 24y - 3 = 0$$
3. Determine if the following lines are parallel, perpendicular, identical, or none of the three.
$$x + 2y - 1 = 0 \text{ and } 4x - 3y + 5 = 0$$
4. Determine if the following lines are parallel, perpendicular, identical, or none of the three.
$$8x - 4y + 2 = 0 \text{ and } 4x - 2y + 1 = 0$$
5. What is the slope of a line which is parallel to $5x + 2y + 1 = 0$?
6. What is the slope of a line which is perpendicular to $3x + 2y - 7 = 0$?
7. Find a general form of the line which passes through $(-2, 1)$ and is parallel to $4x - 3y + 7 = 0$. The coefficients of the general form must be integers.
8. Find a general form of the line which passes through $(1, 0)$ and is parallel to $9x - 10y = 0$. The coefficients of the general form must be integers.
9. Find a general form of the line which passes through $(0, -5)$ and is perpendicular to $x + 3y - 4 = 0$. The coefficients of the general form must be integers.
10. Find a general form of the line which passes through $(6, -1/3)$ and is perpendicular to $5x - 8y - 1 = 0$. The coefficients of the general form must be integers.

Graded Homework 2

1. Determine if the following lines are parallel, perpendicular, identical, or none of the three.

$$4x - 6y + 1 = 0 \text{ and } 2x - 3y + 6 = 0$$

Graded Homework 3

1. Find the distance between $(-2, -1)$ and $(-4, -9)$. Write the answer to 3 significant digits.
2. Find the distance between $(-8, 7)$ and $(1, -5)$.
3. Find the distance between $(-39, 25)$ and $(527, 25)$.
4. Find the distance between $\left(\frac{17}{13}, \frac{25}{24}\right)$ and $\left(\frac{17}{13}, -\frac{47}{32}\right)$. Write the answer as a fraction.

Graded Homework 4

1. Change $23^{\circ}17'14''$ to degrees rounded to five significant digits.
2. Change 67.89° to degrees, minutes, seconds.
3. Suppose ABC is a right triangle with C as its right angle, $a = \sqrt{5}$, and $b = 2$. Draw and label the triangle correctly. Find the six trigonometric ratios for each angle A and B . Use trigonometric function notation correctly and leave each ratio as a fraction or a fraction multiplied by a radical.
4. Suppose ABC is a right triangle with C as its right angle, $a = 3$, and $c = 5$. Draw and label the triangle correctly. Find the six trigonometric ratios for each angle A and B . Use trigonometric function notation correctly and leave each ratio as a fraction or a fraction multiplied by a radical.
5. Suppose ABC is a right triangle with C as its right angle, $b = 2.6$, and $c = 7.4$. Draw and label the triangle correctly. Find the six trigonometric ratios for each angle A and B to 4 significant digits. Use trigonometric function notation correctly.

Graded Homework 5

1. Compute each of the following to 4 significant digits. Solutions must use trigonometric function notation correctly.
 - A. $\sin(13.7^{\circ})$
 - B. $\tan(20.1^{\circ})$
 - C. $\csc(1.24^{\circ})$
 - D. $\cos(24.6^{\circ})$
2. Compute each of the following to 4 significant digits. Solutions must use trigonometric function notation correctly.
 - A. $\cot(2.13^{\circ})$
 - B. $\csc(57.5^{\circ})$
 - C. $\sec(63.8^{\circ})$
 - D. $\cot(74.3^{\circ})$
3. Compute each of the following to 4 significant digits. Solutions must use trigonometric function notation correctly.
 - A. $\cos(19.2^{\circ})$
 - B. $\tan(64.1^{\circ})$
 - C. $\csc(6.05^{\circ})$
 - D. $\sec(36.3^{\circ})$
4. Compute each of the following to 4 significant digits. Solutions must use trigonometric function notation correctly.
 - A. $\csc(48.3^{\circ})$
 - B. $\sec(8.19^{\circ})$
 - C. $\tan(66.6^{\circ})$
 - D. $\sin(7.92^{\circ})$
5. Find angle A to 4 significant digits if A is acute and $\sin(A) = 0.3205$.
6. Find angle A to 4 significant digits if A is acute and $\tan(A) = 23.59$.

- Find angle A to 4 significant digits if A is acute and $\sec(A) = 7.882$.
- Find angle A to 4 significant digits if A is acute and $\cot(A) = 1.023$.

Graded Homework 6

- Solve triangle ABC where C is a right angle, $A = 57^\circ$, and $b = 3.6$. Draw and label the triangle correctly.
- Solve triangle ABC where C is a right angle, $a = 10$, and $c = 18$. Draw and label the triangle correctly.
- Solve triangle ABC where C is a right angle, $B = 73^\circ$, and $b = 7.5$. Draw and label the triangle correctly.
- Solve triangle ABC where C is a right angle, $a = 6.9$, and $b = 6.3$. Draw and label the triangle correctly.
- A canyon has a flat bottom and vertical sides. The east side of the canyon is 30 ft. higher than the west side. The angle of elevation from the top of the west side to the top of the east side is 5.1° . Determine the width of the canyon and the distance from the top of the west side to the top of the east side to the nearest foot. A correct diagram is required.
- A vertical pole that is 3.0 m (meters) high casts a shadow that is 2.0 m long. What is the angle of elevation of the sun? A correct diagram is required.
- Point A is on the ground and is 50 ft away (horizontally) from the base of a building which has vertical sides. The angle of elevation from A to the top of a window on one side of the building is 60° and the angle of elevation from A to point B on the top of the building which is directly above the window is 63° . Determine the distance from B to the top of the window. A correct diagram is required.
- Triangle ABC is a right triangle in which angle C is a right angle, angle $A = 10.0^\circ$, and side $BC = 30.0$ mm (millimeters). Point D is on side AB and point E is on side AC so that segment $DB = 73.0$ mm and angle ADE is a right angle. Determine the length of DE . A correct diagram is required.

Graded Homework 7

- A roadbed rises 112 ft for every 4500 ft of road. Find the angle of elevation of the roadbed rounded to five significant digits. A correct diagram is required.
- At 1:00 pm one day, the angle of depression from a plane in the air to an object on the ground is 13° . If the plane was flying at a height of 15,000 ft, what was the distance from the plane to the object at 1:00 pm? Round the answer to the nearest foot. A correct diagram is required.
- A canyon has a flat bottom and vertical sides. The width of the canyon is 320 ft. The angle of depression from the top of one side of the canyon to the bottom of the other side is 72.6° . Find the height of a side of the canyon to the nearest foot. A correct diagram is required.
- A 5 ft 9 in tall observer is standing 30 ft away from a 20 ft tall flagpole. What angle of elevation would the observer need to use to look at the top of the flagpole? Write the answer to the nearest tenth of a degree. A correct diagram is required.

Graded Homework 8

- What is the smallest positive angle that is coterminal to -682° ?
- What is the largest negative angle that is coterminal to 5513° ?
- Suppose θ is an angle in standard position and the point $(-7, 4)$ is on the terminal side of θ . Find the six trigonometric values of θ . Draw the angle and use trigonometric function notation correctly.

- Suppose θ is an angle in standard position and the point $(4, -2)$ is on the terminal side of θ . Find the six trigonometric values of θ . Draw the angle and use trigonometric function notation correctly.
- Suppose θ is an angle in standard position, and a point on the terminal side of θ has x -coordinate -4 , a negative y -coordinate, and is distance 9 from the origin. Find the six trigonometric values of θ . Draw the angle and use trigonometric function notation correctly.
- Suppose θ is an angle in standard position, and a point on the terminal side of θ has y -coordinate 1, a positive x -coordinate, and is distance 4 from the origin. Find the six trigonometric values of θ . Draw the angle and use trigonometric function notation correctly.
- Suppose θ is an angle in standard position with $0^\circ \leq \theta < 360^\circ$ and $\tan(\theta) = -1.514$. Find all θ that meet these criteria to the nearest tenth of a degree. Each θ must be drawn correctly and the reference angle should be included in the drawing.
- Suppose θ is an angle in standard position with $0^\circ \leq \theta < 360^\circ$ and $\sec(\theta) = 1.403$. Find all θ that meet these criteria to the nearest tenth of a degree. Each θ must be drawn correctly and the reference angle should be included in the drawing.
- Suppose θ is an angle in standard position with $0^\circ \leq \theta < 360^\circ$ and $\csc(\theta) = -4.033$. Find all θ that meet these criteria to the nearest tenth of a degree. Each θ must be drawn correctly and the reference angle should be included in the drawing.

Graded Homework 9

- Compute each of the following to 4 significant digits. Solutions must use trigonometric function notation correctly.
 - $\sin(-135^\circ)$
 - $\cos(143^\circ)$
 - $\tan(-26^\circ)$
 - $\cot(39^\circ)$
- Compute each of the following to 4 significant digits. Solutions must use trigonometric function notation correctly.
 - $\tan(435^\circ)$
 - $\csc(-48^\circ)$
 - $\cot(5297^\circ)$
 - $\sec(-680^\circ)$
- Suppose θ is an angle in standard position with $0^\circ \leq \theta < 360^\circ$ and $\cos(\theta) = -0.3369$. Find all θ that meet these criteria to the nearest tenth of a degree. Each θ must be drawn correctly and the reference angle should be included in the drawing.

Graded Homework 10

- Solve triangle ABC with $A = 13^\circ$, $B = 18^\circ$ and $c = 9.7$. Draw and label the triangle correctly.
- Solve triangle ABC with $B = 44^\circ$, $C = 97^\circ$ and $a = 3.2$. Draw and label the triangle correctly.
- Solve triangle ABC with $C = 21^\circ$, $a = 4.3$ and $c = 5.8$. Draw and label the triangle correctly.
- Solve triangle ABC with $A = 34^\circ$, $a = 5.9$ and $c = 8.6$. Draw and label the triangle correctly.

Graded Homework 11

- Solve triangle ABC with $B = 66^\circ$, $a = 9.4$ and $c = 1.7$. Draw and label the triangle correctly.
- Solve triangle ABC with $C = 23^\circ$, $a = 4.7$ and $b = 6.6$. Draw and label the triangle correctly.
- Solve triangle ABC with $a = 5.1$, $b = 7.6$ and $c = 3.5$. Draw and label the triangle correctly.

4. Solve triangle ABC with $a = 9.8$, $b = 1.2$ and $c = 9.3$. Draw and label the triangle correctly.

Graded Homework 12

1. Solve $\frac{x-1}{x} = \frac{3}{5}$ for x .
2. Solve $\frac{x+3}{5} = \frac{x-2}{4}$ for x .
3. Find x if 42 is three-fourths of x .
4. If 12 ounces of an item cost \$3.29, how much will 16 ounces of the item cost?
5. If 1.5 gallons of paint can cover 525 square feet of wall, how much paint is required to cover two rectangular walls each of which is 15 feet long and 8 feet high.
6. A tourist travels to Europe with 545.00 USD (United States Dollars). The tourist exchanges the dollars and receives 397.81 EUR (Euros, the European currency). The tourist spends 261.23 EUR before returning to the U.S. After returning home, the tourist exchanges the remaining euros for dollars. How many dollars does the tourist receive on the exchange?
7. A rectangular electronic image is 325 pixels in height and 550 pixels wide. If the height is decreased by 75% while maintaining the proportion of the image, what is the width of the new image?
8. Gasohol is a mixture of 90% unleaded gasoline and 10% ethanol. How much ethanol is in 15 gallons of gasoline?
9. Cities A and B are 72 miles apart. On a map, A and B measure 3.25 inches apart. On the same map, cities C and D measure 4.75 inches apart. What is the actual distance from C to D ?
10. If 5.5 gallons of water is required when making 6 cubic feet of concrete, how much water is required when making 45 cubic feet of concrete?

11. Brass is an alloy of copper and zinc. Suppose a 30 lb brass billet (bar) contains 9 lbs of zinc. How much does a brass billet containing 16 lbs of copper weigh?

Graded Homework 13

1. What is the variation equation that corresponds to the following statement?
 q varies directly with the square of p and inversely with the square root of m .
2. If s varies directly with t and $s = 9.7$ when $t = 2.4$, find s when $t = 3.9$.
3. If y varies inversely with x and $y = 3.27$ when $x = 4.39$, find y when $x = 1.05$.
4. Given a fixed area, consider the collection of rectangles which have this area. In this collection, the length of a rectangle varies inversely with its width. If a rectangle with length 30 mm has width 17 mm, what is the width of a rectangle whose length is 14 mm?
5. A balloon is filled with air. If the balloon is put into a freezer, the temperature of the air inside the balloon will decrease causing the density of the air to increase and the volume of the air to decrease, so the balloon will shrink in size even though the amount of air (the mass) in the balloon has not changed. The mathematical relationship is that the density D of the air in the balloon is inversely proportional to the volume V of the air in the balloon. For the following, assume the pressure is 1 atmosphere. When the temperature is 15° Celsius, the density of air is 1.225 mg/cm^3 , and when the temperature is 20° Celsius, the density of air is 1.204 mg/cm^3 . If the balloon has a volume of 1000 cm^3 when the temperature is 15° Celsius, determine its volume when the temperature is 20° Celsius.
6. The volume V of a sphere varies directly with the cube of its radius r . If a sphere with radius 2.10 cm has volume 38.8 cm^3 , what is the volume of a sphere whose radius is 3.20 cm?

- A large tank of water has several drains on its bottom. The amount of time T it takes to empty a full tank varies inversely with the number of drains N which are open. If it takes 90 minutes to empty a full tank when 4 drains are open, how long will it take to empty the tank if 9 drains are open?
- The speed of light v in a transparent material is inversely proportional to its index of refraction n . In ice the index of refraction is 1.31 and the speed of light is 2.29×10^8 m/s. The index of refraction of diamond is 2.42. Find the speed of light in diamond.

Graded Homework 14

- Evaluate the following determinant.

$$\begin{vmatrix} 3 & 14 \\ -12 & -9 \end{vmatrix}$$

- Evaluate the following determinant.

$$\begin{vmatrix} -5 & 7 & -10 \\ -9 & -6 & -13 \\ -8 & 5 & 19 \end{vmatrix}$$

- Use Cramer's rule to solve the following system.

$$\begin{aligned} 3x + 4y &= 10 \\ 5x + 2y &= -2 \end{aligned}$$

- Use Cramer's rule to solve the following system.

$$\begin{aligned} 3x - y &= 7 \\ 4x + 9y &= 10 \end{aligned}$$

- Use Cramer's rule to solve the following system.

$$\begin{aligned} -3x &+ z = 5 \\ x - 3y + 4z &= 7 \\ 6y - 2z &= -4 \end{aligned}$$

- Use Cramer's rule to solve the following system.

$$\begin{aligned} 2x - y &= 5 \\ 4y + 2z &= -7 \\ 9x + 8y + z &= 11 \end{aligned}$$

Graded Homework 15

- Simplify $\sqrt{-600}$.

- Perform the following addition.

$$(20 - 54j) + (-13 - 98j)$$

- Perform the following subtraction.

$$(-16 - 45j) - (29 - 67j)$$

- Perform the following multiplication.

$$(-8 + 3j)(-10 - 5j)$$

- Perform the following multiplication.

$$(16 - 22j)(-14 + 17j)$$

- Perform the following division.

$$\frac{5 - 3j}{-2 + j}$$

- Perform the following division.

$$\frac{7 + 9j}{6 - 10j}$$

- Solve the following equation for x . Do not use the quadratic equation.

$$x^2 + 144 = 0$$

- Solve the following equation for x .

$$3x^2 + 9 = 2x$$