

Calculus Part 2

1. Roland's Boat Tours sells deluxe and economy seats for each tour it conducts. In order to complete a tour, at least 1 economy seats must be sold and at least 6 deluxe seats must be sold. The maximum number of passengers allowed on each boat is 30. Roland's Boat Tours makes \$40 profit for each economy seat sold and \$35 profit for each deluxe seat sold. What is the maximum profit from one tour?

(Show work)

of passenger allowed = 30

Boat tour make \$40 profit for each economy so

\$40 profit x 30 passengers = 1,200 profit from economy

Deluxe seat sold \$35 x 30 = 1,050 profit from Deluxe

2. The senior class is having a fundraiser to help pay for the senior trip. Selling a box of chocolates yields a profit of \$2.45, while selling a box of cookies yields a profit of \$2.70. The demand for cookies is at least twice that of chocolates, but the amount of cookies produced must be no more than 550 boxes plus 3 times the number of chocolates produced. Assuming that the senior class can sell every box that they order, how many boxes of each should they order to maximize profit if they cannot order more than 1950 boxes combined?

(Show work)

	So $466(3) + 550$
Cookies Chocolate	= 1,948 total Ambire
$550 + 3(x) = 1950$	
$550 + 3x = 1950$	
- 550 - 550	
- $\frac{3x}{3} = \frac{1,400}{3}$	They will have 550 box for cookies and they will
X = 466	Need $466(3) = 1,398$ which will give a total of 1,948
	combine.

3. A projectile is fired from ground level with an initial velocity of 35 m/s at an angle of 35° with the horizontal. How long will it take for the projectile to reach the ground?

(Show work)

$$0 = v_i \sin \theta t - \frac{1}{2} g t^2$$

$$t = \frac{35 \sin(35^\circ)}{9.8}$$

$$t = 1.1$$

4. A discus is thrown from a height of 4 feet with an initial velocity of 65 ft/s at an angle of 44° with the horizontal. How long will it take for the discus to reach the ground?

(Show work)

2.9 seconds

5. A rock is tossed from a height of 2 meters at an initial velocity of 30 m/s at an angle of 20° with the ground. Write parametric equations to represent the path of the rock.

(Show work)

$$x = 30t \cos 20^\circ$$

$$y = 30t \sin 20^\circ$$

6. An airplane is taking off headed due north with an air speed of 173 miles per hour at an angle of 18° relative to the horizontal. The wind is blowing with a velocity of 42 miles per hour at an angle of $S47^\circ E$. Find a vector that represents the resultant velocity of the plane relative to the point of takeoff. Let **i** point east, **j** point north, and **k** point up.

(Show work)

Airplane airspeed = 173mi/hr. Angel = 18° relative to horizon

Wind Velocity = 42mi/hr. Angel = $S47^\circ E$

Answer = Airplane vector = $\langle 173 \cos(18^\circ) \ 173 \sin(18^\circ) \rangle$

$$= \langle 164.53, 53.46 \rangle$$

$$\begin{aligned}\text{Wind vector} &= \langle 42\cos(-47^\circ), 42\sin(-47^\circ) \rangle \\ &= \langle -28.64, -30.72 \rangle\end{aligned}$$

$$\begin{aligned}\text{Airplane vector} + \text{wind vector} &= \langle 164.53 + (-28.64), 53.46 + (-30.72) \rangle \\ &= \langle 135.89, 22.74 \rangle\end{aligned}$$

7. A 2600-pound truck is stopped at a red light on a hill with an incline of 25° . Ignoring the force of friction, what force is required to keep the truck from rolling down the hill?

(Show work)

$$X = 2600 \sin 25 = -344$$

$$N = 2600 \cos 25 = 2,577$$

8. While doing bicep curls, Tamara applies 155 Newtons of force to lift the dumbbell. Her forearm is 0.366 meters long and she begins the bicep curl with her elbow bent at a 15° angle below the horizontal, in the direction of the positive x -axis. Determine the magnitude of the torque about her elbow.

(Show work)

$$155\text{N} \times 0.366\text{M} \times \sin 15$$

$$= 14.68$$

9. Jenny is sitting on a sled on the side of a hill inclined at 15° . What force is required to keep the sled from sliding down the hill if the combined weight of Jenny and the sled is 90 pounds?

(Show work)

$$F = 90 \times \sin 15^\circ = 59 \text{ lb}$$

10. Anne is pushing a wheelbarrow filled with mulch to place in her garden. She is pushing the wheelbarrow with a force of 70 N at an angle of 50° with the horizontal. How much work in joules is Anne doing when she pushes the wheelbarrow 25 meters?

(Show work)

$$W = f \times d$$

$$70\text{N} \times 25\text{m} = 1750 \text{ joules}$$

11. A baseball player running forward at 3 meters per second throws a ball with a velocity of 20 meters per second at an angle of 20° with the horizontal. What is the resultant speed and direction of the throw?

(Show work)

$$S = vt + \frac{1}{2} at^2$$

$$S = 3 \sin 20 \times 9.8$$

$$H = 1.02 \times 9.8 = 10$$

$$S = 10$$

12. Write $18(\cos 169^\circ + i \sin 169^\circ)$ in rectangular form. Round numerical entries in the answer to two decimal places.

(Show work)

$$18(\cos 169^\circ + i \sin 169^\circ)$$

$$18(\cos 169 + i \sin 169)$$

$$= 18 \cos 169 + 18 i \sin 169$$

$$14 + (-10) i$$

$$= 14 - 10 i$$

13. Find the rectangular coordinates of .

(Show work)

$$R = [x^2 + y^2]$$

$$R = 9^2 + 150^2 = 22,581$$

14. Find the distance between (7,) and (5,) on the polar plane.

(Show work)

$$\text{Points } (7, \frac{217}{180}x) \quad \text{Points } (5, \frac{23}{36}x)$$

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$D = \sqrt{(5 - 7)^2 + (\frac{23}{36}x - \frac{217}{180}x)^2}$$

$$D = \sqrt{25 - 49 + (\frac{23}{36^2} - \frac{217^2}{180^2} x^2)}$$

$$D = \sqrt{-2 (0.41 - 1.45x^2)}$$

$$D = \sqrt{-3.04x}$$

$$\text{Answer: } D = \sqrt{-3.04x}$$

15. A music concert is organized at a memorial auditorium. The first row of the auditorium has 16 seats, the second row has 24 seats, the third row has 32 seats, and so on, increasing by 8 seats each row for a total of 50 rows. Find the number of people that can be accommodated in the sixteenth row.

(Show work)

$$A(n) = 16 + 8(n + 1)$$

$$A(16) = 16 + 8(10 - 1)$$

$$A(16) = 136 \text{ people}$$

16. Makya was conducting a physics experiment. He rolled a ball down a ramp and calculated the distance covered by the ball at different times. The ball rolled a distance of 1 foot during the first second, 3 feet during the next second, and so on. If the distances the ball rolled down the ramp each second form an arithmetic sequence, determine the distance the ball rolled down during the fifteenth second.

(Show work)

To find the distance I will use $AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Points 1 (1, 1ft)

Point 2 (2, 3)

↑ ↑

↑ ↑

One second rolled

Two second rolled

So I will apply

$$AB = \sqrt{(2 - 1)^2 + (3 - 1)^2}$$

$$= \sqrt{(4 - 2) + 9 - 2}$$

$$= \sqrt{6 + 7}$$

$$D = \sqrt{13}$$

$$D = 3.60$$

So, after 15 seconds, the ball will roll at 15 second x 3.60 = 54

For each statement, write the null and alternative hypotheses. State which hypothesis represents the claim.

17. John claims that he can list the birth dates of more than 15 students of his class.

Null $H_o : x \leq 15$

Alternative $H_A : x > 15$ - claim

The alternative hypothesis represents my claim.

The chirp rates n (in number of chirps per minute) of snowy tree crickets and the air temperature T (in degree Fahrenheit) are shown in the table below.

n	33	54	72	95	112	136
T	45	50	55	65	70	75

18. Use the regression capabilities of a graphing calculator to find the least squares regression line for the data.

$$N = x$$

$$T = y$$

$$Y = ax + b$$

$$A = .308824$$

$$B = 34.161765$$

$$Y = .309x + 34.16$$

19. A company's marginal cost function is where x is the number of units. Find the total cost of producing units 144 to 625.

(Show work)

$$MC = 94 = \sqrt{625} \quad x = \text{units}$$

$$x = 625$$

$$MC = \frac{94}{25} = \$3.76$$

$$\text{Total cost } \$3.76 \times 144 = 541.44$$

$$Tc = 541.44$$

20. A technician can test video player chips at the rate of chips per hour (for), where t is the number of hours after 9:00 am. How many chips can be tested between 11:00 a.m. to 3:00 p.m.? (Assume for 9:00 a.m.)

(Show work)

$3t^2 + 16t + 5$ chips per hr.

Assume $t = 0$

$$T = 0$$

So it will be

$$- 3(0)^0 + (16)^0 + 5 \text{ chips}$$

$$0 + 0 + 5 \text{ chips}$$

Between 11 to 3 O'clock = 5 chips will be tested