

**1. (50 points)**

- (i) Find the angle that the planet moves through in one year in both degrees and radians
- (ii) Find the linear velocity (km/hr) as it orbits the Sun.
- (ii) Find the angular velocity of the Neptune in radians per hour

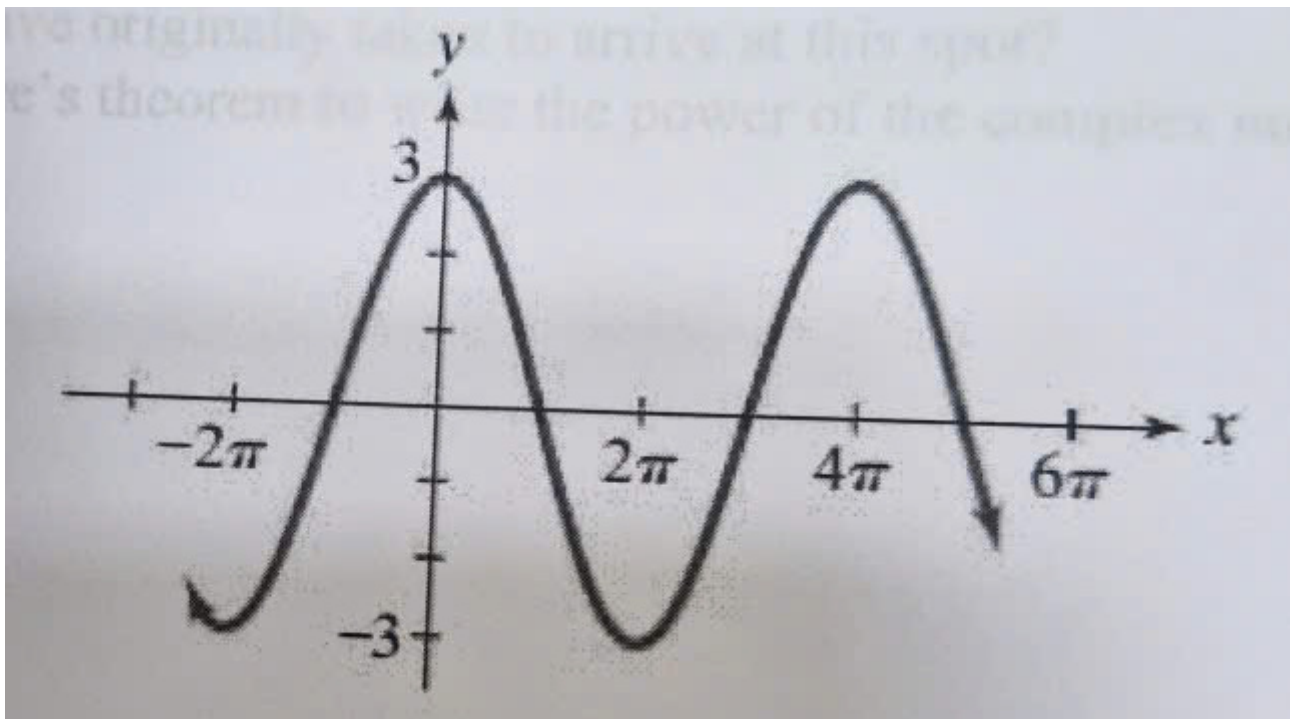
b) Do not use the calculator, find the exact values of the expression

- a)  $\cot(\cos^{-1}(-\frac{4}{5}))$
  - b)  $\cos^{-1}(\sin(\frac{9\pi}{14}))$
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**2. (50 points)**

a) Sketch the graph of the functions  $y = 2 \sin(\frac{x}{2} + \frac{\pi}{4})$

b) Find the function whose graph is given below

**3. (50 points)**

a) You are on a fishing boat that leaves its pier and heads east. After traveling for 25 miles, there is a report warning of rough seas directly south. The captain turns the boat and follows a bearing of  $S40^\circ W$  for 13.5 miles. What bearing could the boat have originally taken to arrive at this spot?

b) Use De Moivre's theorem to write the power of the complex number in standard form:

$$(\sqrt{3} - i)^6$$

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**4. (50 points)**

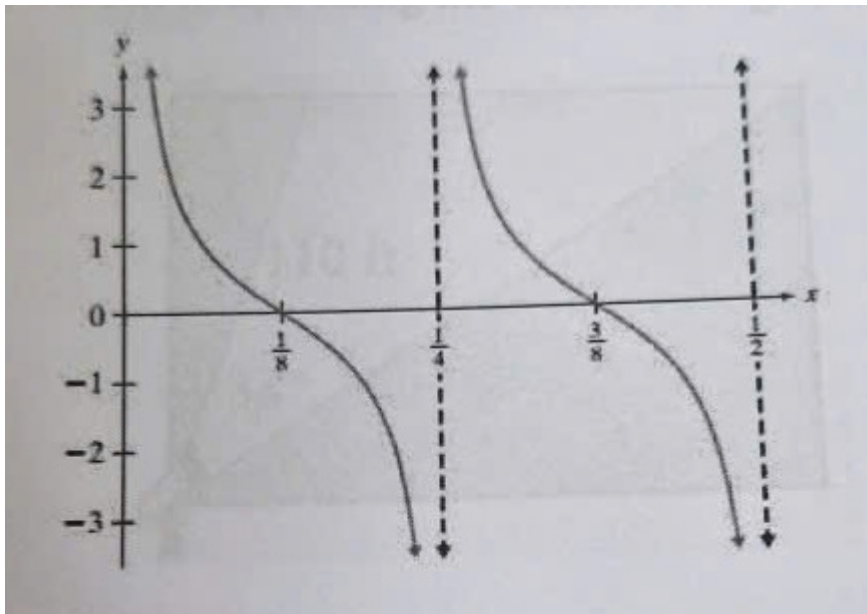
a) Find all the solutions of the equations  $\sec x + \tan x = 2$  in the interval  $[0, 2\pi)$ . Use exact values where possible or give the approximate solution correct to four decimal places

b) Find the partial fraction decomposition of the rational expression  $\frac{5x^2 - 9x + 19}{(x-4)(x^2+5)}$

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**5. (50 points)**

a) The function has the form  $y = \cot(Bx)$  and its graph is given below. Find the value of B.

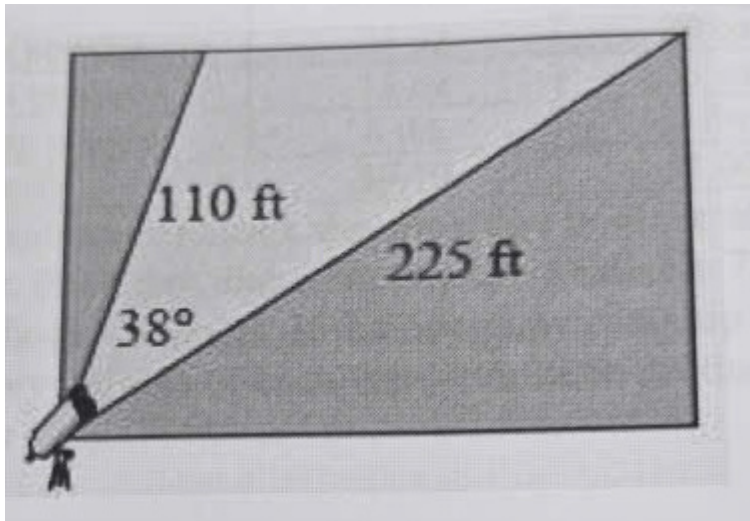


b) Find the exact value using sum-to-product formula:  $\sin\left(\frac{11\pi}{12}\right) + \sin\left(\frac{7\pi}{12}\right)$

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**6. (50 points)**

a) A stationary surveillance camera is set up to monitor activity in the parking lot of a shopping mall. If the camera has a field of vision, how many square feet of the parking lot can it tape using the dimensions given?



b) Write the exact value of all the complex fifth roots of  $z = 8\sqrt{2}(1 - i)$

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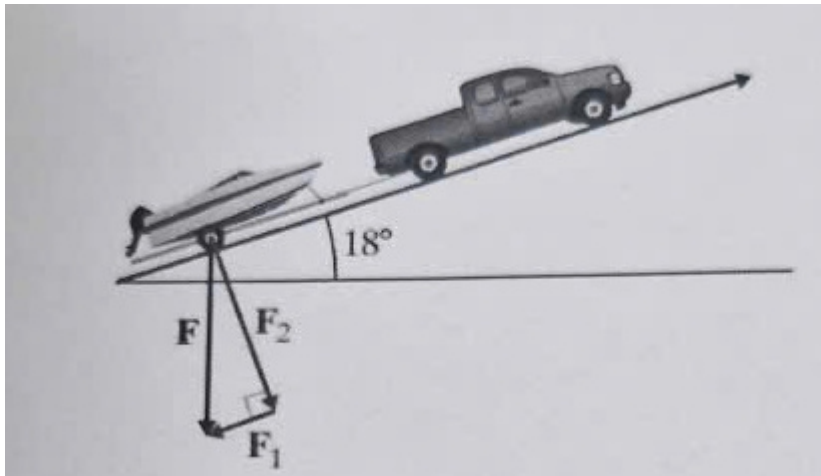
**7. (50 points)** A Dessert Company makes two kinds of frozen yogurt: regular and premium. The properties of 1 gallon (gal) of each type are shown in the table:

|                   | Regular | Premium |
|-------------------|---------|---------|
| Cocoa powder      | 25 oz   | 20 oz   |
| Milk-fat products | 15 oz   | 25 oz   |
| Shipping weight   | 6 lbs   | 7 lbs   |
| Profit            | \$0.70  | \$1.00  |

In addition, current commitments require the company to make at least 1 gal of premium for every 5 gal of regular. Each day, the company has available 725 pounds (lb) of cocoa powder and 500 lb of milk-fat products. If the company can ship no more than 3000 lb of product per day, how many gallons of each type should be produced daily to maximize profit? (1 pound = 16 oz)

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**8. (50 points)** A boat and trailer weighing a total of 450 lb are parked on a boat ramp with an  $18^\circ$  angle of inclination.



- Write the force vector  $F$  in terms of the standard unit vectors  $i$  and  $j$
- Find the component vector of  $F$  perpendicular to the ramp.
- Find the component vector of  $F$  parallel to the ramp.
- Find the magnitude of the force needed to keep the trailer from moving down the ramp.