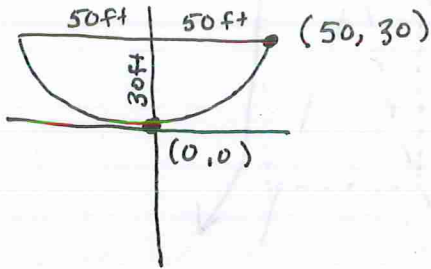


Please show all work for credit. You may use your notes and graphing calculator for all questions on the exam. Show all work for credit. Your cell phone should be turned off and not on your desk at any time of the exam.

3. 1. **Satellite Dish.** A satellite dish measures 100 feet across its opening and 30 feet deep at its center. The receiver should be placed at the focus of the parabolic dish. Where is the focus? The focus is feet away from the vertex of the satellite dish.



$$\begin{aligned} (x-0)^2 &= 4p(y-0) \\ (50-0)^2 &= 4p(30-0) \\ 2500 &= 4p(30) \\ 2500 &= 120p \\ p &= \frac{2500}{120} = 20.8\bar{3} \end{aligned}$$

6. 2. Find the center, vertices, foci, and graph $25x^2 + y^2 + 150x - 8y + 216 = 0$

$$\begin{aligned} 25x^2 + 150x + \square + y^2 - 8y + \square &= -216 \\ 25(x^2 + 6x + \square) + y^2 - 8y + \square &= -216 \\ \downarrow \quad \uparrow \quad \downarrow \quad \uparrow & \\ (\frac{6}{2})^2 = 9 \quad (\frac{-8}{2})^2 = 16 & \end{aligned}$$

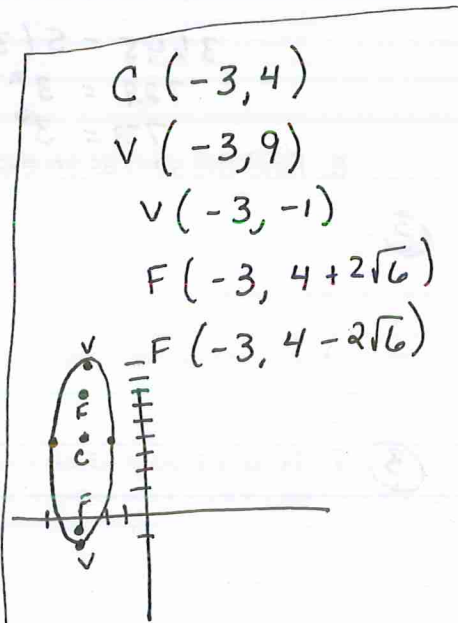
$$\frac{25(x+3)^2}{25} + \frac{(y-4)^2}{25} = \frac{25}{25}$$

$$\frac{(x+3)^2}{1} + \frac{(y-4)^2}{25} = 1$$

$a = 1$ L/R

$b = 5$ U/D

$c = \sqrt{1-25} = \sqrt{24} = \sqrt{4 \cdot 6} = 2\sqrt{6}$ U/D



3. Find the center, vertices, foci, asymptotes, and graph $\frac{(x-4)^2}{9} - \frac{(y+2)^2}{100} = 1$

$C(4, -2)$

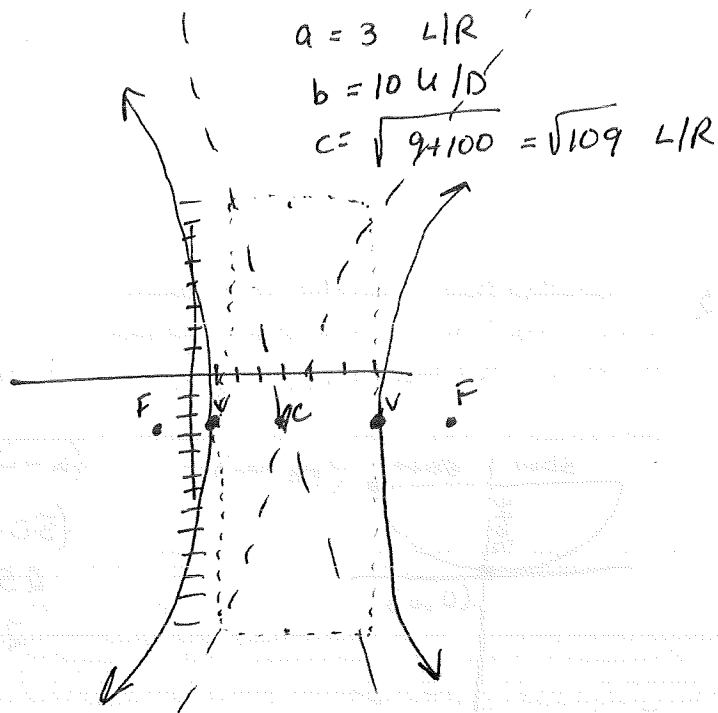
$V(7, -2)$

$V(1, -2)$

$F(4 + \sqrt{109}, -2)$

$F(4 - \sqrt{109}, -2)$

$y + 2 = \pm \frac{10}{3}(x - 4)$



4. Find the sum of $10 + 13 + 16 + 19 + \dots + 307$

$a_n = 3n + 7$

$307 = 3n + 7$

$300 = 3n$
 $n = 100$

$\sum_{n=1}^{100} (3n + 7) = \frac{n(a_1 + a_n)}{2} = \frac{100(10 + 307)}{2} = 15850$

5. Find the sum of $5 + 15 + 45 + 135 + \dots + 3645$

$a_n = 5(3)^{n-1}$ (geometric)

$3645 = 5(3)^{n-1}$

$729 = 3^{n-1}$

$729 = 3^6$

$\sum_{n=1}^7 5(3)^{n-1} = \frac{a_1(1-r^n)}{1-r} = \frac{5(1-3^7)}{1-3} = 5465$

6. Find the sum as an exact answer, if possible. $\sum_{n=1}^{\infty} 3\left(\frac{2}{5}\right)^{n-1}$ (geometric $r = 2/5 < 1$)

$= \frac{a_1}{1-r} = \frac{3}{1-\frac{2}{5}} = \frac{3}{\frac{3}{5}} = 3 \cdot \frac{5}{3} = 5$

7. Find the sum as an exact answer, if possible. $\sum_{n=1}^{\infty} 3\left(\frac{5}{2}\right)^{n-1}$ (geometric $r = 5/2$ not less than 1)

No sum