Ex $a > -1, \neq 0$

$(1+a)^n > 1+na \quad n \geq 2$

if $n = 1 \Rightarrow (1+a)^1 \overset{?}{\geq} 1+a$

$1+a \geq 1+a$ #

for $n = 2 \Rightarrow (1+a)^2 \overset{?}{>} 1+2a$

$\Leftarrow 1+2a+a^2 > 1+2a \quad (a^2 > 0)$

P_2 is true

Assume P_k is true : $(1+a)^k > 1+ka$

$\therefore$ is P_{k+1} : $(1+a)^{k+1} > 1+(k+1)a$?

$(1+a)^{k+1} = (1+a)^k (1+a)$

$> (1+ka)(1+a)$

$= 1+a+ka+ka^2$

$= 1+(k+1)a+ka^2$

$(k > 2;\ a > -1 \neq 0 \Rightarrow ka^2 > 0)$

$(1+a)^{k+1} > 1+(k+1)a$ ✓

P_{k+1} is also true.

$\therefore$ By the mathematical induction, the given proof is completed.

5.2 Hwk #3

$$\frac{s^2+1}{s^3-2s^2-8s} = \frac{A}{s} + \frac{B}{s-4} + \frac{C}{s+2}$$

$$s(s^2-2s-8)$$

$$s^2+1 = A(s^2-2s-8) + Bs(s+2) + Cs(s-4)$$

s^2: $A + B + C = 1$ ①

s^1: $-2A + 2B - 4C = 0$ ② $\quad -A + B - 2C = 0$

s^0: $-8A = 1 \Rightarrow \underline{A = -\frac{1}{8}}$

① $B + C = 1 + \frac{1}{8} = \frac{9}{8}$ ⟸

② $-B + 2C = +\frac{1}{8}$

$3C = \frac{10}{8} = \frac{5}{4}$

$\underline{C = \frac{5}{12}}$

$\underline{B = \frac{9}{8} - \frac{5}{12} = \frac{17}{24}}$

$$\frac{s^2+1}{s^3-2s^2-8s} = -\frac{1}{8}\frac{1}{s} + \frac{17}{24}\frac{1}{s-4} + \frac{5}{12}\frac{1}{s+2}$$

#4: $\frac{1}{x^2+2x} = \frac{A}{x} + \frac{B}{x+2}$

$1 = A(x+2) + Bx$

x^1 $\quad A + B = 0 \Rightarrow \underline{B = -\frac{1}{2}}$

x^0 $\quad 2A = 1 \Rightarrow \underline{A = \frac{1}{2}}$

$$\frac{1}{x^2+2x} = \frac{1}{2}\frac{1}{x} - \frac{1}{2}\frac{1}{x+2}$$

#5 $\frac{2x+1}{x^2-7x+12} = \frac{A}{x-3} + \frac{B}{x-4}$

$2x+1 = A(x-4) + B(x-3)$

x^1 $\quad A + B = 2$

x^0 $\quad -4A - 3B = 1$

$B = 9$

$A = 2 - 9 = -7$

$$\frac{2x+1}{x^2-7x+12} = \frac{-7}{x-3} + \frac{9}{x-4}$$

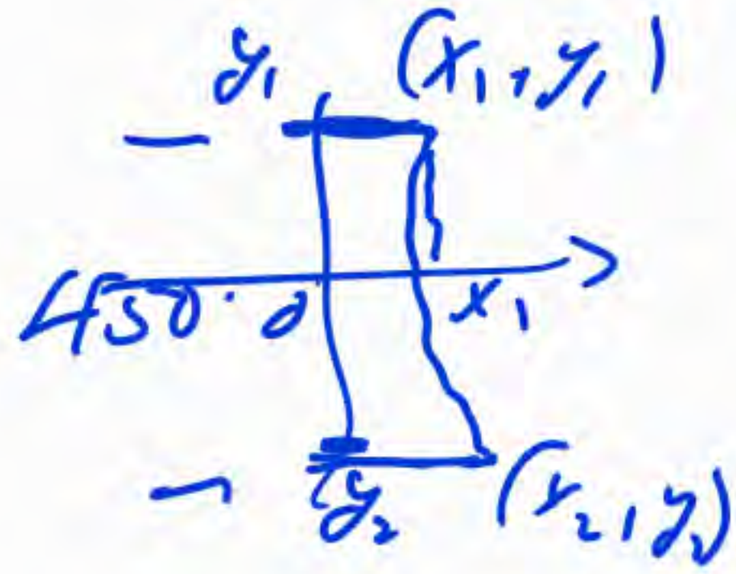
$4A + 4B = 8$

$-4A - 3B = 1$

$B = 9$

5.4 - Hwk

① $\frac{x^2}{90^2} - \frac{y^2}{130^2} = 1$



② $y_1 + y_2 = 450$

$y_1 = \frac{1}{2} y_2$

$2y_1 = y_2$

② $y_1 + 2y_1 = 450$

$3y_1 = 450$

$y_1 = 150$ $\quad y_2 = 300$

① $\frac{x_1^2}{90^2} = 1 + \frac{150^2}{130^2}$

$= 1 + \left(\frac{15}{13}\right)^2$

$= 1 + \frac{225}{169}$

$= \frac{169 + 225}{13^2}$

$x_1^2 = \frac{90^2}{13^2}(394)$

$x_1 = \frac{90}{13}\sqrt{394}$

Top diameter $= 2x_1$

$= \frac{180}{13}\sqrt{396}$ ft

$\frac{x_2^2}{90^2} = 1 + \left(\frac{30}{13}\right)^2$

$= 1 + \frac{900}{169}$

$x_2^2 = \frac{90^2}{13^2}(169 + 900)$

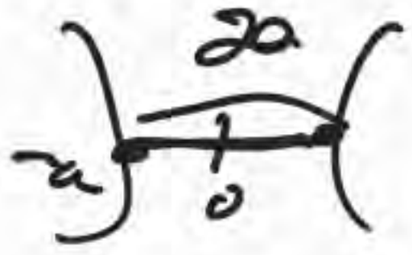
$x_2 = \frac{90}{13}\sqrt{1069}$

Bottom diameter $= \frac{180}{13}\sqrt{1069}$ ft

5.4 #27

$625y^2 - 400x^2 = 250,000$

$\frac{y^2}{400} - \frac{x^2}{625} = 1$



Closest point distance $= 2a$

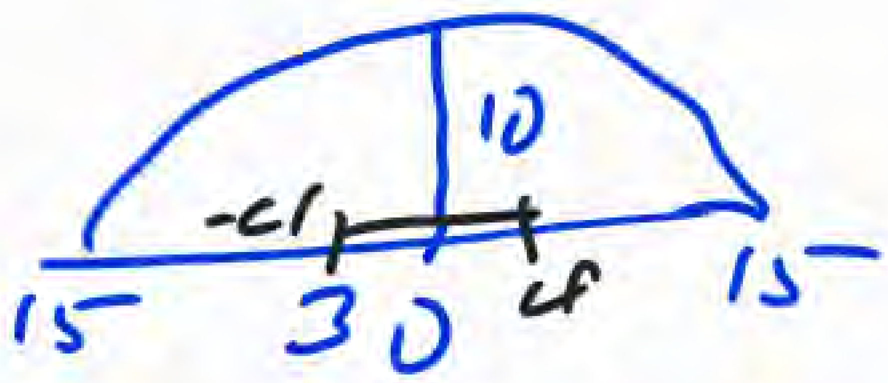
$= 2\sqrt{400}$

$= 40$

5.3 #36

$w = 8$ ft

$h = 7$



$$\frac{x^2}{15^2} + \frac{y^2}{10^2} = 1$$

$$\frac{y^2}{10^2} = 1 - \frac{4^2}{15^2}$$

$$= \frac{225-16}{15^2}$$

$$y^2 = \frac{10^2}{15^2}(209)$$

$$\overset{49}{\cancel{64}} \; ? \; \left(\frac{\overset{2}{\cancel{10}}}{\underset{3}{\cancel{15}}}\right)^2 (209)$$

$$9(49) \; ? \; 4(209)$$

$$441 < 836$$

will pass

$$\left(\frac{4}{15}\right)^2 + \left(\frac{7}{10}\right)^2 \; ? \; 1$$

$$\frac{16}{225} + \frac{49}{100}$$

5.6 #4)

$$\left\{(-1)^{n-1} \frac{n+7}{2n}\right\}$$

$n=1 \rightarrow (-1)^0 \frac{1+7}{2} = 4$

$n=2 \rightarrow (-1)^1 \frac{2+7}{4} = -\frac{9}{4}$

$n=3 \rightarrow (-1)^2 \frac{3+7}{6} = \frac{10}{6} = \frac{5}{3}$

$n=4 \rightarrow (-1)^3 \frac{4+7}{8} = -\frac{11}{8}$

$n=8 \rightarrow (-1)^7 \frac{8+7}{16} = -\frac{15}{16}$

Before exam 10 minutes before
your name 1st → Initial
when you done. → Type conversation
Done, Fuki
? pages

10 → (9) → ? #

You can not leave til I tell you

#19 a_{10}: $a_8 = 8$ $a_{20} = 44$ arith
5.6

$$d = \frac{y_2 - y_1}{x_2 - x_1} = \frac{44 - 8}{20 - 8} = \frac{36}{12}$$
$$= 3$$

$$a_n = a_1 + (n-1)d$$
$$8 = a_1 + (7)(3) \quad a_8$$
$$a_1 = 8 - 21$$
$$= -13$$

$$a_{10} = -13 + 9(3)$$
$$= -13 + 27$$
$$= 14$$

67-71 Geom

69 a_9 : $a_2 = 3$ $a_5 = -81$

$$r = \left(\frac{y_2}{y_1}\right)^{\frac{1}{x_2 - x_1}} = (-27)^{\frac{1}{3}} \left(\frac{-81}{3}\right)^{\frac{1}{5-2}}$$

$$= -(3^3)^{\frac{1}{3}}$$

$$= \underline{-3}$$

$$a_n = a_1 (-3)^{n-1}$$

$$3 = a_1 (-3)^1$$

$$\underline{a_1 = -1}$$

$$a_9 = (-1)(-3)^8$$

$$= \underline{-3^8}$$

$$8 + 12 + 18 + 27 + \cdots - \sum_{n=1}^{\infty} 8 \left(\frac{3}{2}\right)^{n-1}$$

$$r = \frac{12}{8} = \frac{3}{2}$$

---

1 4 7 10 13 16 19