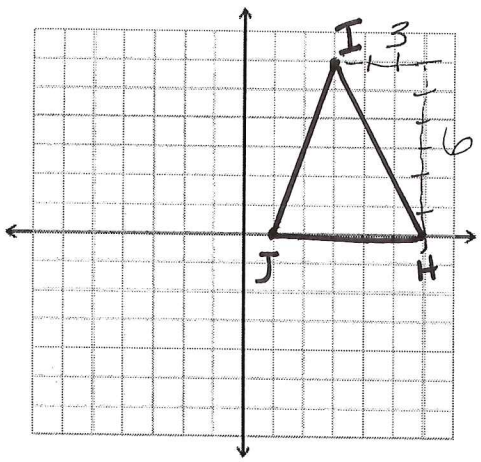
5.1 HW: Coordinate Geometry

Key

COORDINATE GEOMETRY The vertices of $\triangle HIJ$ are $J(1, 0)$, $H(6, 0)$, and $I(3, 6)$. Find the coordinates of the points of concurrency of $\triangle HIJ$.



1. Centroid

Midpt of JH
$(\frac{7}{2}, 0)$

Midpt of HI
$(\frac{9}{2}, 3)$

$(\frac{7}{2}, 0)$ and $I(3,6)$

$m = \frac{6}{-.5}$ $m = -12$

$y - 6 = -12(x-3)$

$y - 6 = -12x + 36$

$\boxed{y = -12x + 42}$

$(\frac{9}{2}, 3)$ and $J(1,0)$

$m = \frac{0-3}{1-\frac{9}{2}} = \frac{-3}{-3.5} = \frac{6}{7}$

$y - 0 = \frac{6}{7}(x-1)$

$\boxed{y = \frac{6}{7}x - \frac{6}{7}}$

Solve

$7(-12x+42) = (\frac{6}{7}x - \frac{6}{7})7$

$-84x + 294 = 6x - 6$

$-90x = -300$

$x = \frac{300 \div 30}{90 \div 30}$

$\boxed{x = \frac{10}{3}}$

$y = -12(\frac{10}{3}) + 42$

$\boxed{y = 2}$

Centroid
$(\frac{10}{3}, 2)$

2. Circumcenter

midpt of JH $(\frac{7}{2}, 0)$

Slope JH = 0 ⊥ slope = und.

$\boxed{x = \frac{7}{2}}$ Eq. #1

Midpt of HI $(\frac{9}{2}, 3)$

Slope HI $= -\frac{6}{3} = -2$

⊥ slope $= \frac{1}{2}$

$y - 3 = \frac{1}{2}(x - \frac{9}{2})$

$y - 3 = \frac{1}{2}x - \frac{9}{4}$

$\boxed{y = \frac{1}{2}x + \frac{3}{4}}$ eq #2

$\boxed{x = \frac{7}{2}}$ yay!

$y = \frac{1}{2}(\frac{7}{2}) + \frac{3}{4}$

$y = \frac{7}{4} + \frac{3}{4}$

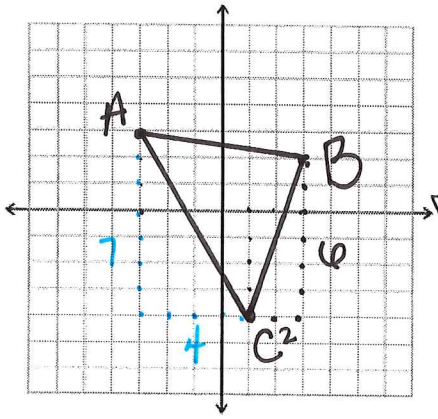
$y = \frac{10}{4}$ $\boxed{y = \frac{5}{2}}$

Circumcenter
$(\frac{7}{2}, 5/2)$

Pg. 274 #3

⊥ bisectors :)

COORDINATE GEOMETRY The vertices of $\triangle ABC$ are $A(-3, 3)$, $B(3, 2)$, and $C(1, -4)$. Find the coordinates of the circumcenter.



Midpt of BC

$\frac{3+1}{2}, \frac{2+-4}{2}$

$\boxed{(2, -1)}$

Slope BC $= \frac{6}{2} = 3$

$\therefore$ ⊥ slope is $-\frac{1}{3}$

Eq. #1 $y+1 = \frac{-1}{3}(x-2)$

$\boxed{y = -\frac{1}{3}x - \frac{1}{3}}$

Midpt of AC

$\left(\frac{-3+1}{2}, \frac{3+-4}{2}\right)$

$\left(-1, -\frac{1}{2}\right)$

Slope AC $= \frac{-7}{4}$ $\therefore$ ⊥ slope $\frac{4}{7}$

Eq #2 $y + \frac{1}{2} = \frac{4}{7}(x+1)$

$y + \frac{7}{14} = \frac{4}{7}x + \frac{8}{14}$

$-\frac{7}{14} \qquad -\frac{7}{14}$

$\boxed{y = \frac{4}{7}x + \frac{1}{14}}$

Solve:

$.14\left(-\frac{1}{3}x - \frac{1}{3}\right) = \left(\frac{4}{7}x + \frac{1}{14}\right).14$

$3\left(-\frac{14}{3}x - \frac{14}{3}\right) = (8x+1)3$

$-14x - 14 = 24x + 3$

$-17 = 38x$

$\boxed{\frac{-17}{38} = x}$

$y = -\frac{1}{3}\left(\frac{-17}{38}\right) - \frac{1}{3}$

$\boxed{y = \frac{-7}{38}}$

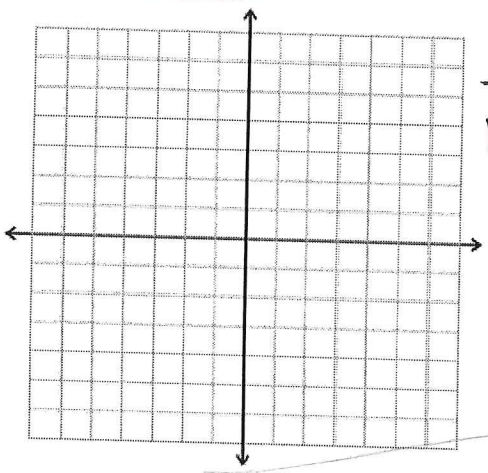
Circumcenter

$\left(\frac{-17}{38}, \frac{-7}{38}\right)$

Pg. 275 #16-22

COORDINATE GEOMETRY The vertices of $\triangle DEF$ are $D(4, 0)$, $E(-2, 4)$, and $F(0, 6)$. Find the coordinates of the points of concurrency of $\triangle DEF$.

16. centroid **17.** orthocenter **18.** circumcenter



medians

midpt of DE

$\left(\frac{-2+4}{2}, \frac{4+0}{2}\right)$

$(1, 2)$

midpt of EF

$\left(\frac{-2+0}{2}, \frac{4+6}{2}\right)$

$(-1, 5)$

$(1,2)$ and $F(0,6)$

Slope: $\frac{6-2}{0-1} = \frac{4}{-1}$ $\boxed{m=-4}$

$\boxed{y=-4x+6}$

$(-1,5)$ and $D(4,0)$

$\frac{0-5}{4+1} = \frac{-5}{5} = -1$

$\boxed{y=-1x+4}$

Solve

$-4x+6=-1x+4$

$2=3x$

$\boxed{\frac{2}{3}=x}$

$y=-1\left(\frac{2}{3}\right)+4$

$\boxed{y=10/3}$

Centroid

$\left(\frac{2}{3}, \frac{10}{3}\right)$

Pg. 275 #16-22

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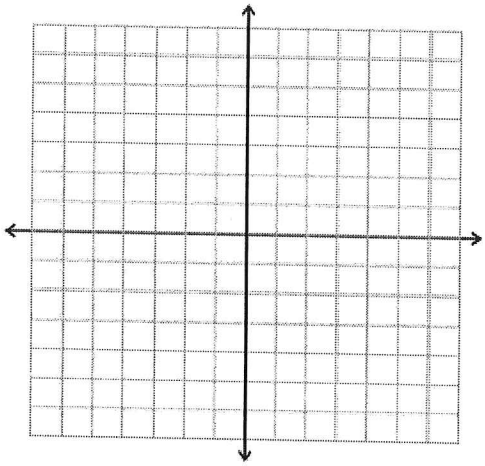

Altitudes!

Slope DE $\frac{4-0}{-2-4} = \frac{4}{-6} = \frac{-2}{3}$

$\boxed{\perp \text{ slope } \frac{3}{2} \text{ thru } F(0,6)}$

$\boxed{y = \frac{3}{2}x + 6}$ Eq #1

Slope FD

$\frac{0-6}{4-0} = \frac{-6}{4} = \frac{-3}{2}$

$\boxed{\perp \text{ slope } \frac{2}{3} \text{ thru } E(-2,4)}$

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

$y - 4 = \frac{2}{3}x + \frac{4}{3}$ $+4$

$+4$

$\boxed{y = \frac{2}{3}x + \frac{16}{3}}$

$\frac{3}{2}x + 6 = \frac{2}{3}x + \frac{16}{3}$

$\frac{3}{2}x = \frac{2}{3}x - \frac{2}{3}$

$\frac{5}{6}x = \frac{-2}{3}$

$\boxed{x = -\frac{4}{5}}$

$y = \frac{3}{2}\left(-\frac{4}{5}\right) + 6$

$\boxed{y = \frac{24}{5}}$

ORTHOCENTER

$\left(-\frac{4}{5}, \frac{24}{5}\right)$

Pg. 275 #16-22

COORDINATE GEOMETRY The vertices of $\triangle DEF$ are $D(4, 0)$, $E(-2, 4)$, and $F(0, 6)$. Find the coordinates of the points of concurrency of $\triangle DEF$.

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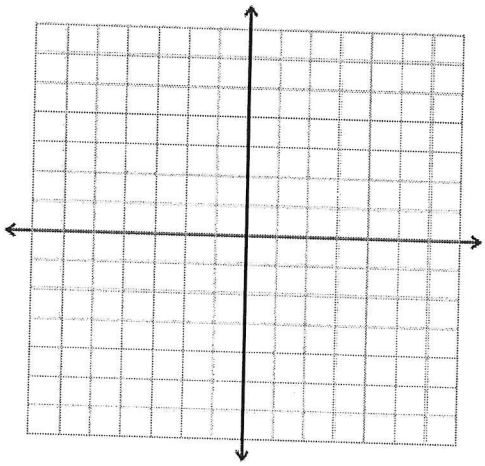


midpt of DE

$(1, 2)$ $\perp$ slope is $\frac{3}{2}$

midpt of FD

$(2, 3)$ $\perp$ slope is $\frac{2}{3}$

$y - 2 = \frac{3}{2}(x - 1)$

$y - 2 = \frac{3}{2}x - \frac{3}{2}$

$\boxed{y = \frac{3}{2}x + \frac{1}{2}}$

$y - 3 = \frac{2}{3}(x - 2)$

$y - 3 = \frac{2}{3}x - \frac{4}{3}$

$\boxed{y = \frac{2}{3}x + \frac{5}{3}}$

$\frac{3}{2}x + \frac{1}{2} = \frac{2}{3}x + \frac{5}{3}$

$\frac{5}{6}x = \frac{7}{6}$

$\boxed{x = \frac{7}{5}}$

$y = \frac{3}{2}\left(\frac{7}{5}\right) + \frac{1}{2}$

$\boxed{y = \frac{13}{5}}$

Circumcenter

$\left(\frac{7}{5}, \frac{13}{5}\right)$

COORDINATE GEOMETRY **For Exercises 19–22, use the following information.**

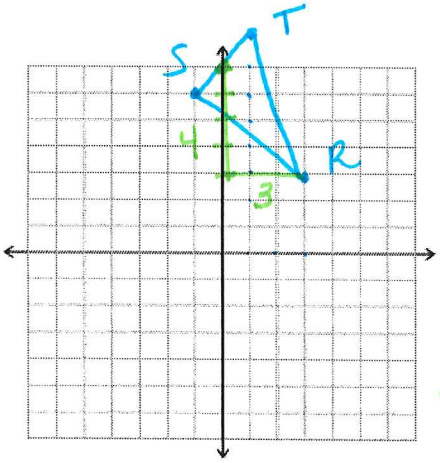
$R(3, 3)$, $S(-1, 6)$, and $T(1, 8)$ are the vertices of $\triangle RST$, and $\overline{RX}$ is a median.

19. What are the coordinates of X?

20. Find RX.

21. Determine the slope of $\overleftrightarrow{RX}$. Then find the equation of the line.

22. Is $\overline{RX}$ an altitude of $\triangle RST$? Explain.



RX (3,3) X is midpt of ST

19.) $\left(\frac{-1+1}{2}, \frac{6+8}{2}\right) = (0,7)$

20.) $RX^2 = 3^2 + 4^2$ Distance

$\boxed{RX = 5}$

21.) $\frac{3-7}{3-0} = \boxed{\frac{-4}{3}}$ slope

$\boxed{y = -\frac{4}{3}x + 7}$

22.) Slope ST $\frac{2}{2} = 1$

Slope RX $= -\frac{4}{3}$ If RX was an altitude RX's slope should be -1 ∴ RX is NOT an altitude because the slopes are not ⊥.

Solutions:

1. $(^{10}/_3, 2)$
2. $(^7/_2, ^5/_2)$
3. $(-^{17}/_{38}, -^7/_{38})$
16. $(^2/_3, ^{10}/_3)$
17. $(-^4/_5, ^{24}/_5)$
18. $(^7/_5, ^{13}/_5)$
19. (0,7)
20. 5 units
21. $m = -^4/_3$; $y=-^4/_3x+7$
22. No, slopes are not perpendicular.