**Activity 5.4.5 Tangents in the Coordinate Plane**



Circle *A* is centered at the origin with equation $x^{2}+y^{2}=400.$

1. Points *B, C, D,* and *E* lie on the circle. Their *x*-coordinates are given. Find the *y* coordinates.

*B*(20, \_\_\_\_\_)
*C*(0, \_\_\_\_\_)
*D*(12, \_\_\_\_\_)
*E*(–12, \_\_\_\_\_)

2. Find the slopes of each of the radii drawn:

 Slope of $\overbar{AB}$ = \_\_\_\_\_\_\_\_\_\_\_ Slope of $\overbar{AC}$ = \_\_\_\_\_\_\_\_\_

 Slope of $\overbar{AD}$ = \_\_\_\_\_\_\_\_\_\_\_ Slope of $\overbar{AE}$ = \_\_\_\_\_\_\_\_\_

3. $\overleftrightarrow{BG}$, $\overleftrightarrow{CG}$, $\overleftrightarrow{DF}$, and $\overleftrightarrow{EF}$ are tangents to the circle. Find the slopes of each of these tangent lines.

 Slope of $\overleftrightarrow{BG}$ = \_\_\_\_\_\_\_\_\_\_\_ Slope of $\overleftrightarrow{CG}$ = \_\_\_\_\_\_\_\_\_

 Slope of $\overleftrightarrow{DF}$= \_\_\_\_\_\_\_\_\_\_\_ Slope of $\overleftrightarrow{EF}$ = \_\_\_\_\_\_\_\_\_

4. What theorem did you use to answer question 3?

5. Find the equations of tangent lines $\overleftrightarrow{BG}$ and $\overleftrightarrow{CG}$:

 Equation of $\overleftrightarrow{BG}:$ \_\_\_\_ = 20 Equation of $\overleftrightarrow{CG}:$ \_\_\_\_ = 20

6. Find the equations of tangent lines $\overleftrightarrow{DF}$ and $\overleftrightarrow{EF}.$ (Hint: recall the point-slope form of the equation of a line: $y-y\_{1}=m(x-x\_{1})$

 Equation of $\overleftrightarrow{DF}$: Equation of $\overleftrightarrow{EF}$:

7. Find the coordinates of point *F*, the intersection of $\overleftrightarrow{DF}$ and $\overleftrightarrow{EF}.$

8. Find the lengths of tangent segments $\overbar{DF}$ and $\overbar{EF}$. What do you notice? What theorem does this illustrate?