I. FIND THE DERIVATIVE OF EACH FUNCTION. YOU NEED NOT SIMPLIFY YOUR RESULT (IN FACT I'D RATHER PREFER IT IF YOU DIDN'T).

1. $f(x) = 4x^5 + 5x^4$

2. $f(x) = \sqrt{x} + \dfrac{1}{\sqrt[3]{x}}$

3. $f(x) = \tan(x) - \cos(x^3)$

4. $f(x) = \dfrac{x^{-3} - x}{\sin(x)}$

5. $f(x) = x^4 \tan(x)$

6. $f(x) = \left(x^{-3} - x^{-2}\right)^{-1}$

7. $f(x) = \dfrac{\sin(x)}{x^2}$

8. $f(x) = -x\csc(x) - \cos(x)$

9. $f(x) = \sqrt{1 + \cot(x)}$

10. $f(x) = \left(\dfrac{x-2}{x-4}\right)^3$

II. FIND THE SECOND DERIVATIVE OF EACH FUNCTION.

14. $f(x) = x^2 + \cos^2(x)$

15. $f(x) = \left(x^2 + 2\right)^5$

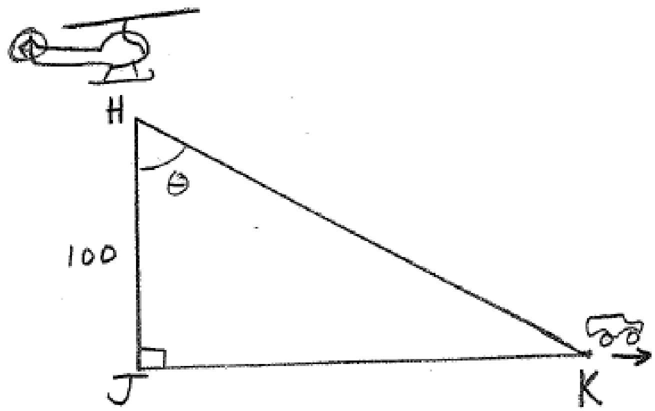
III. USE IMPLICIT DIFFERENTIATION TO FIND $\dfrac{dy}{dx}$.

16. $x^2 + 3xy + y^3 = 10$

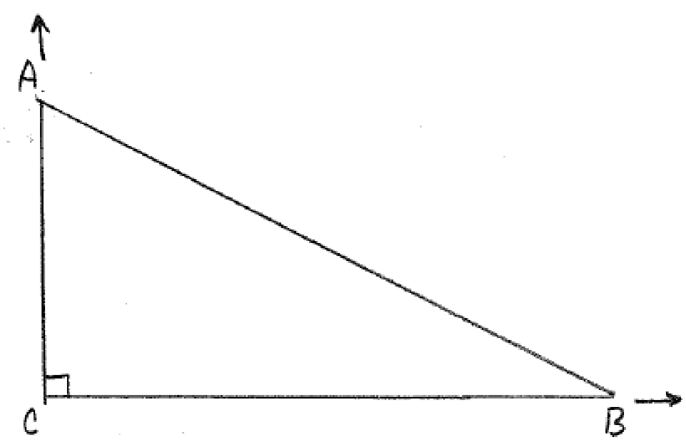
17. $\cos(x + 2y) = x + 2y$

IIII. USE THE METHODS DISCUSSED IN CLASS TO SOLVE EACH PROBLEM.

18. A HELICOPTER IS HOVERING 100ft ABOVE A JEEP, WHICH IS NOT MOVING. A KIA SEDONA IS MOVING AWAY FROM THE JEEP AT THE RATE OF 3000 ft/min. HOW FAST IS THE ANGLE θ (SEE PICTURE) CHANGING (IN DEGREES PER MINUTE) WHEN THE KIA SEDONA IS 142.85ft AWAY FROM THE JEEP?



19. FROM STARTING POINT C (SEE PICTURE) TWO STEAMROLLERS LEAVE AT THE SAME TIME. "STEAMROLLER A" IS GOING DUE NORTH AT THE RATE OF 45ft/min AND "STEAMROLLER B" IS GOING DUE EAST AT THE RATE OF 60ft/min. HOW FAST IS THE DIAGONAL DISTANCE BETWEEN THEM INCREASING 2 MINUTES AFTER THEY START?
HINT: DETERMINE HOW FAR EACH HAS TRAVELED DURING THE TWO MINUTES.



20. A CONE IS EXPANDING IN SUCH A WAY THAT THE HEIGHT IS ALWAYS $\sqrt{3}$ TIMES THE RADIUS. ASSUME THE CONE'S LATERAL AREA IS INCREASING AT THE RATE OF $120 cm^2/min$ WHEN THE RADIUS IS 10cm. WHAT IS THE RATE OF CHANGE OF THE CONE'S VOLUME AT THAT SAME POINT IN TIME?
THE FORMULAE FOR VOLUME AND LATERAL AREA ARE:

$$V = \frac{1}{3}\pi r^2 h \qquad L = \pi r \sqrt{r^2 + h^2}$$