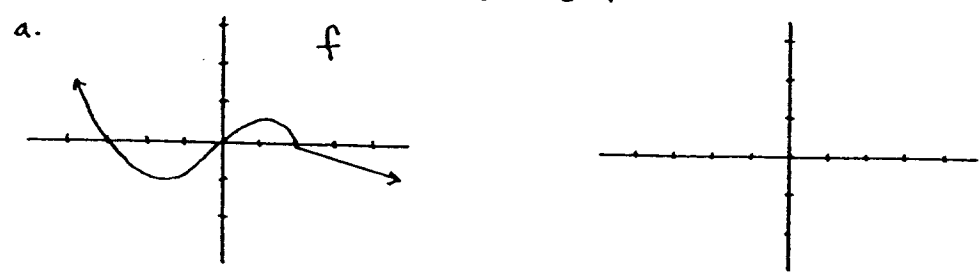**ESP**
Kouba
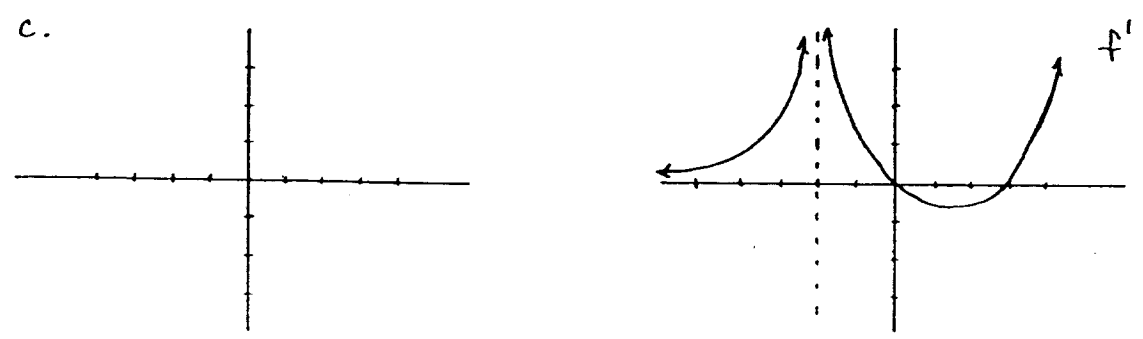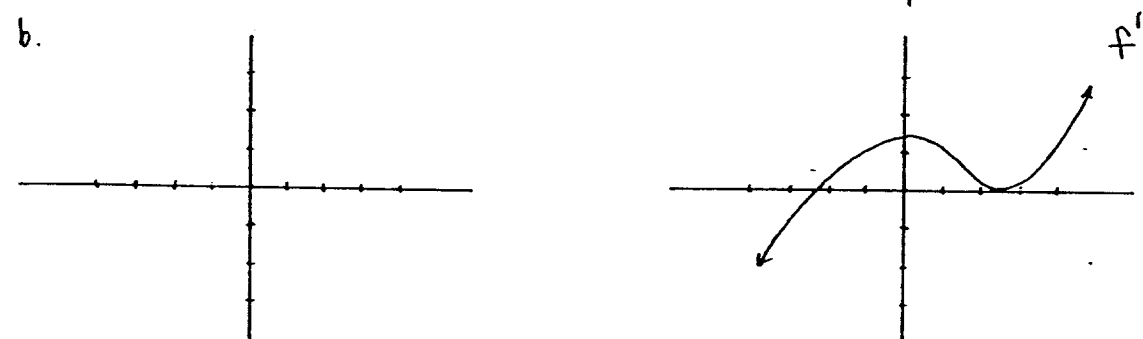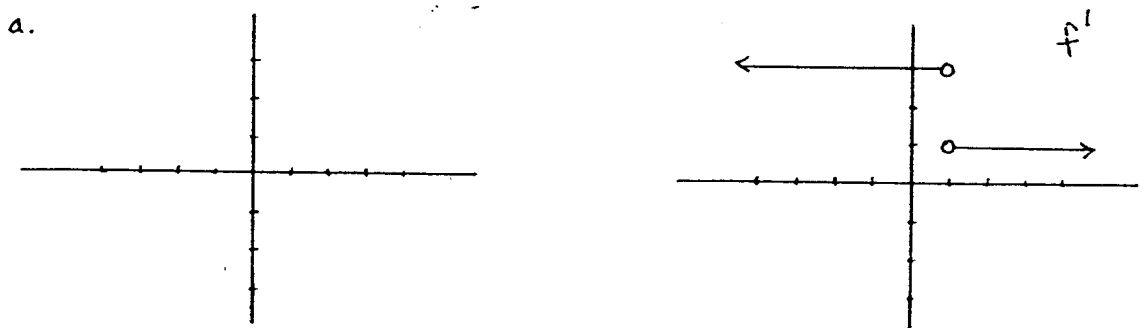**Worksheet 9**

1. Sketch the graph of f' by using the graph of f.

a.

b.
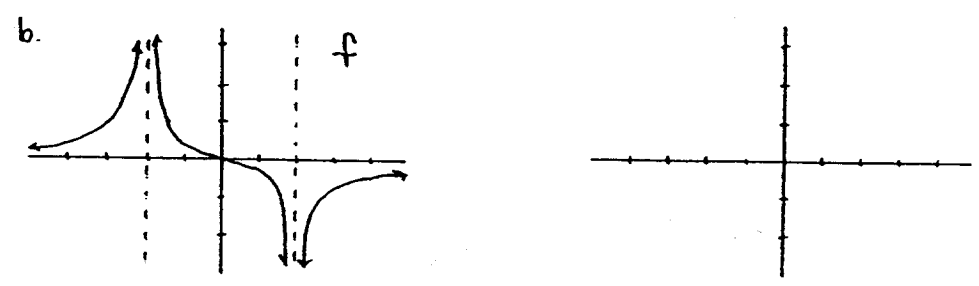
2. Sketch a graph of f by using the graph of f'.

a.

b.

c.

1

3. Write each of the following functions f as a composition of two functions g and h so that $f(x) = (g \circ h)(x) = g(h(x))$.

    a. $f(x) = (\sin x + 17)^{1/3}$

    b. $f(x) = 1 + \sqrt{x^3 + \tan x}$

    c. $f(x) = 5/2 \cos[\pi(\sec x)]$

4. Write each of the following functions f as a composition of three functions g, h, and s, so that $f(x) = (g \circ h \circ s)(x) = g(h(s(x)))$.

    a. $f(x) = 7(5(3x+1)^2 + 2)^3 - 4$

    b. $f(x) = \tan\sqrt{x^3 + x - 7}$

    c. $f(x) = (x^5 + \tan^2(x^5 + 1))^{50}$

5. Find all points on the graph of $y = \begin{cases} x^2 & \text{for } x \geq 0 \\ -x^2 & \text{for } x < 0 \end{cases}$ whose tangent lines pass through the point (4, 3).

6. Differentiate. You need not simplify your answers.

    a. $y = 3x \tan x$ b. $y = \tan(3x)^2$

    c. $y = \tan^2(3x)$ d. $y = [\tan(3x)]^2$

    e. $f(x) = \sin(2x)\cos(\pi^3)$ f. $g(x) = \cos^3(\pi x)$

    g. $y = \sin(\cos(3x))$ h. $g(x) = \sqrt{x} \cdot \sec x$

    i. $f(x) = \sin\sqrt{x}$ j. $y = \dfrac{\sin x}{1 + \cos x}$

k. $y = 9 - (x + (9x - 1)^4)^{70}$

l. $y = \sqrt{1 + \sqrt{1 + \sqrt{1 + x}}}$

m. $f(x) = \left(\dfrac{x}{x + 7} \right)^{10}$

n. $f(x) = \dfrac{(1 - x)^3}{(x - 7)^{1/5}}$

o. $g(x) = \sin (\cos (\tan (\sec (\pi/4))))$

7. Find all values of x for which $f'(x) = 0$, where
$f(x) = x(x - 1)^5 (2 + x)^3$.

8. Consider the line $y = -1/2\, x - 3$ and $f(x) = x^3 - 2x^2$.

   a. Sketch the graph of each function on the same set of axes.
   b. Determine equations for all lines which are parallel to the given line and which meet the graph of f orthogonally.