1) (25 Minutes)   15 points
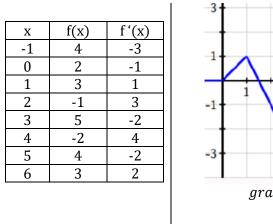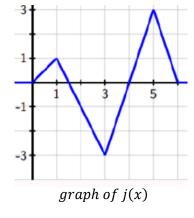
Let f be a twice-differentiable function.
The table gives values of f and its
derivative f' at selected values of x.

Let $g(x) = \sin(3x) - e^{\cos(2x)}$

Let $h(x) = \displaystyle\int_6^x j(x)dx$

x	f(x)	f'(x)
-1	4	-3
0	2	-1
1	3	1
2	-1	3
3	5	-2
4	-2	4
5	4	-2
6	3	2

graph of j(x)

a) Is there a value of c for $1 < x < 5$ such that $f''(c) = -\frac{3}{4}$? Provide an explanation for your answer.
b) Let k be the function defined by $k(x) = f(j(x))$. Write an equation for the line tangent to the graph of k at x = 2
c) Find the slope of the tangent line to the graph of g at $x = \pi$
d) *Find $h(4)$ and $h'(4)$*
e) *On what interval is **h** increasing and concave down? Justify your answer.*
f) *Find the absolute minimum, absolute max value of the h on the interval $0 \le x \le 6$. Justify your answers.*
g) *Evaluate $\int_1^3 f''(2x)\, dx$*

2) (15 minutes)   9 points

Let $y = f(x)$ be a particular solution to the differential equation $\frac{dy}{dx} = \frac{1}{xy}$ with $f(1) = 2$.

a) Find $\frac{d^2y}{dx^2}$ at the point (1, 2)
b) Write an equation for the line tangent to the graph of f at (1,2) and use it to approximate f(1.1). Is the approximation for f(1.1) greater or less than f(1.1)? Explain your reasoning.
c) Find the solution of the given differential equation that satisfies the initial condition $f(1) = 2$
d) Let g be a differential function such that $g(x) = f^{-1}(x)$ for all x. What is the value of g'(2)?