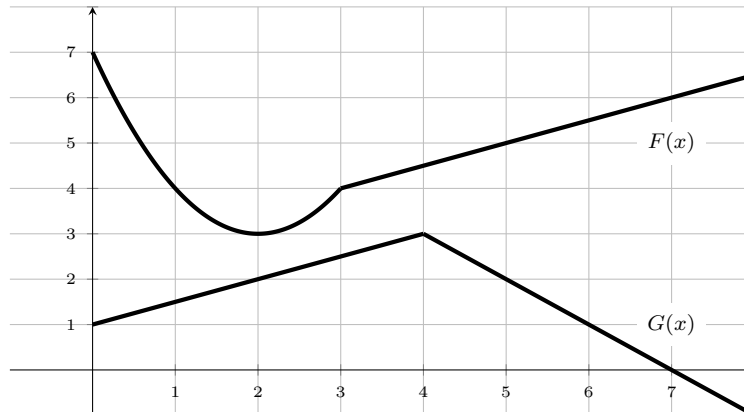MAT265 Homework 04

Due Date: February 17, 2016   Name: _____

Instructions: The following exercises are similar to those found in the course text book [related text book question are in brackets]. Show ALL your work and write neatly. This assignment is due at the beginning of the class period on the date above. Group work is allowed and encouraged, but each member must write up his/her own solutions. Submissions without staples, without a name, or without work shown *will not receive credit*.

1. [§2.4, #40] Suppose $f(\frac{\pi}{4}) = \frac{1}{2}$ and $f'(\frac{\pi}{4}) = -3$, and let $g(x) = f(x)\sin(x)$ and $h(x) = \frac{\cos(x)}{f(x)}$. Find the following derivatives:
   a. $g'(\frac{\pi}{4})$
   b. $h'(\frac{\pi}{4})$

2. [§2.4, #42] If $f(3) = 4$, $g(3) = 2$, $f'(x) = -6$, and $g'(x) = 5$, find the following numbers.
   a. $(f+g)'(3)$
   b. $(fg)'(3)$
   c. $(\frac{f}{g})'(3)$
   d. $(\frac{g}{f})'(3)$

3. [§2.4, #44] Let $P(x) = F(x)G(x)$ and $Q(x) = \frac{F(x)}{G(x)}$, where F and G are the functions whose graphs are shown.
   a. Find $P'(2)$
   b. Find $Q'(7)$

4. [§2.4, #46] If g is a differentiable function, find an expression for the derivative of each of the following functions
   a. $y = x^3 g(x)$
   b. $y = \frac{g(x)}{x^4}$
   c. $y = \frac{x^2}{g(x)}$
   d. $y = \frac{1+xg(x)}{\sqrt{x}}$

5. [§2.5, #54] If $h(x) = \sqrt{3 + 2f(x)}$, where $f(2) = 3$ and $f'(2) = 5$, find $h'(2)$.

6. [§2.5, #56] A table of values for f, g, f', and g' is given.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	3	2	4	6
2	1	8	5	7
3	7	2	7	9

    a. If $F(x) = f(f(x))$, find $F'(2)$.

    b. If $G(x) = g(g(x))$, find $G'(3)$.

    c. If $H(x) = g(f(x))$, find $H'(2)$.

7. [§2.5, #58] If f is the function whose graph is shown, let $h(x) = f(f(x))$ and $g(x) = f(x^2)$. Use the graph of f to estimate the value of each derivative.

    a. $h'(2)$

    b. $g'(2)$
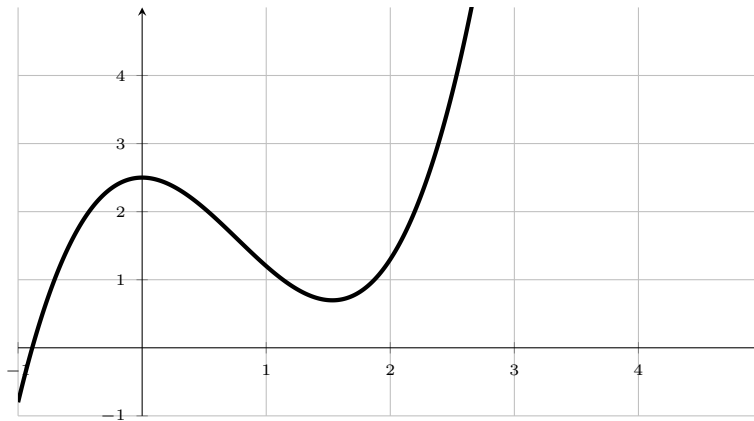
8. [§2.5, #60] Suppose f is differentiable on $\mathbb{R}$ and α is a real number. Let $F(x) = f(x^\alpha)$ and $G(x) = [f(x)]^\alpha$. Find expressions for:

    a. $F'(x)$

    b. $G'(x)$

9. [§2.5, #62] If g is a twice differentiable function and $f(x) = g(x^3)\sin(x)$, find f'' in terms of g, g', and g''.