Math 251

Note: This is a practice midterm and is intended only for study purposes. The actual exam will contain different questions and perhaps a different layout.

1. [] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f and g be functions.

   T F $\frac{d}{dx}b^c = cb^{c-1}$ for a fixed b and c

   T F $(x+y)^2 = x^2 + y^2$

   T F $\frac{d}{dx}2^x = x2^{x-1}$

   Show your work for the following problems. The correct answer with no supporting work will receive NO credit (this includes multiple choice questions).

2. Find the following:
   $\lim\limits_{x \to 0} \dfrac{3\sin(4x)}{2\sin(3x)}$

3. Suppose that $f(2) = -3$, $g(2) = 4$, $f'(2) = -2$, and $g'(2) = 7$. Find $h'(2)$ where h is:

$h(x) = 5f(x) - 4g(x)$

$h(x) = f(x)g(x)$

$h(x) = \frac{f(x)}{g(x)}$

$h(x) = \frac{g(x)}{1+f(x)}$

4. If $F(x) = f(g(x))$, where $f(-2) = 8$, $f'(-2) = 4$, $f'(5) = 3$, $g(5) = -2$, and $g'(5) = 6$, find $F'(5)$.

5. If $G(x) = f(xf(xf(x)))$, where $f(1) = 2$, $f(2) = 3$, $f'(1) = 4$,$f'(2) = 5$, and $f'(3) = 6$, find $G'(1)$.

6. Find the $\frac{dy}{dx}$ of the following:

$$y = \frac{\sin(x) + x^2 \cos(x)}{\cos(\frac{1}{x})}$$

$$y = (2x^2 + \ln(7x^2))(e^x - 4)$$

$$y = \frac{x^{\frac{1}{4}}\sqrt{x^4+2}}{(4x-3)^7}$$

$$x^2 + y^2 = 25$$

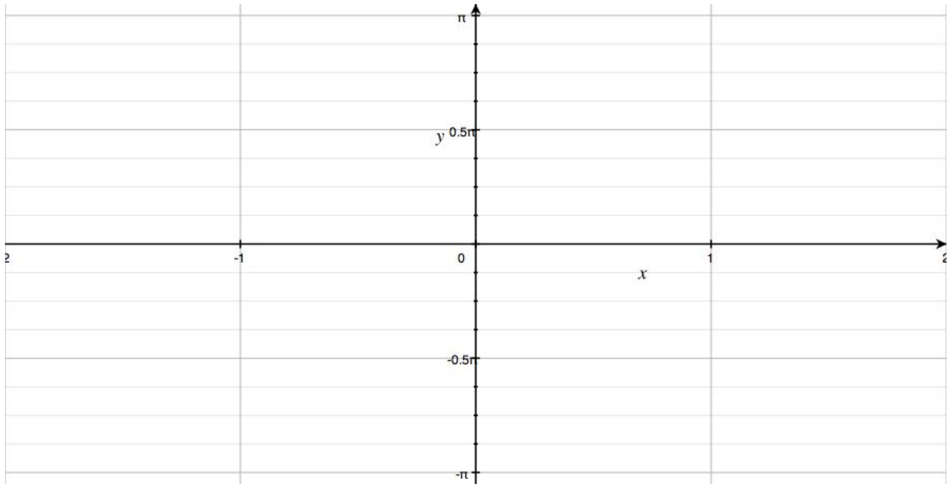
$$y = \sin(e^{\ln(x^2)})$$

$$y = (\sin x)^{\ln x}$$

7. Find the equations of all lines tangent to the curve described by the relation $x^2y^2+xy = 2$ that are also parallel to the line described by $y = -x - \pi$.

8. Consider the relation $y = \arcsin x$. The following problem will step you through the *proof* that $\frac{d}{dx}(\arcsin(x)) = \frac{1}{\sqrt{1-x^2}}$.

(a) Draw the graph of $y = \arcsin x$ in the space provided below.



(b) What is the domain of arcsin?

(c) Use Implicit Differentiation to find $\frac{dy}{dx}$ in terms of x and y.

(d) Use simplification procedures and trig identities to wrtie $\frac{dy}{dx}$ in terms of only x. Cite when the domain restriction of arcsin was necessary.