HOMEWORK #7

Math 106 Review Packet for Exam #1

Due Friday February 9 at the beginning of class.

Derivatives

1. Differentiate each of the following functions. **Do not** simplify your answers.

   (a) $f(x) = \dfrac{\left(\cos x - \dfrac{1}{\sqrt{x}}\right)^9}{\sec(4x)}$

   (b) $y = \sin^3(x^3)$

   (c) $f(t) = t^2 \sin^5(2t)$

   (d) $g(x) = \cos(3x)\sin(4x)$

   (e) $g(x) = \dfrac{\cos(3x)}{\sin(4x)}$

   (f) $g(t) = \cos\left(\sin^3\left(\dfrac{t}{\sqrt{t+1}}\right)\right)$

   (g) $g(x) = \sqrt{\cos(x^2 - \sin x)} + \sin\sqrt{x^2 + \sec x} + \dfrac{1}{\tan(\sqrt{x} + \cos x)}$

2. Compute $f'\left(\dfrac{\pi}{12}\right)$, where $f(x) = \cos^2(2x) + \sec(4x) + \dfrac{\sqrt{3}}{\tan^2(3x)}$. Simplify.

3. Consider $\sin(xy) = \sec x + \cos(\pi) - y$. Compute the derivative $\dfrac{dy}{dx}$.

4. Compute the equation of the tangent line for each curve at the given point.

   (a) $4 \cos x \sin y = 3$ at $(\pi/6, \pi/3)$.

   (b) $y^3 - xy^2 + \cos(xy) = 2$ at $(0, 1)$

Related Rates

5. A photographer is televising a 100-yard dash from a position 5 yards from the track in line with the finish line. When the runners are 12 yards from the finish line, the camera is turning at the rate of $\frac{3}{5}$ radians per second. How fast are the runners moving then?

Antiderivatives

6. An object moves on a number line. Its acceleration at time t is given by $a(t) = t + \cos t$ ft/sec^2. Assume also that its velocity at time $t = 0$ is 3 feet per second, and its position at time $t = 0$ is at -2 feet on the number line. Find its position at time t.

7. If $f'(t) = t^2(1+t) + 2\sin t$ and $f(0) = 3$, find $f(t)$.

8. Find the general antiderivative of $\dfrac{x^2 + \sqrt{x}}{x^{\frac{3}{7}}}$.

9. Find the general antiderivative of $\left(x^2 + \dfrac{1}{x^2}\right)\left(\sqrt{x} + \dfrac{1}{\sqrt{x}}\right)$.