Math 2413 **Homework Set 6** **10 Points**

Implicit Differentiation

For problems 1 & 2 find y'.

1. $\mathbf{e}^{x^2} - y^8 = x^4 \sin(10y)$

2. $\mathbf{e}^{6y^3 - x^2} = 8x + \cos(y)$

3. Find the equation of the tangent line to $\sin\left(x^2 y^4\right) = 1 + 6y\,x^3$ at (-2, 0).

Related Rates

In order to receive any credit for problems 4 – 6 you MUST use Calculus techniques to find the answer. Any decimal work should include at least 4 decimal places.

4. A snowball in the shape of a sphere is melting in such a way that it is losing volume at a rate of 6cm^3/sec. How fast is the radius of the snowball decreasing when the surface area of the snowball is 48π cm^2?

5. A tank of water in the shape of a cone is being filled at a rate of 3.5 ft^3/min. The tank is 10 ft tall and has a base radius of 32 ft. At what rate is the height of the water in the tank changing when the water is 3 ft deep?

6. Two boats start out 1500 miles apart with boat A directly to the west of boat B. At the same time both boats start moving with boat A traveling to the east at 30 mph while boat B travels north at 60 mph. Determine if the distance between the boats is increasing, decreasing or not changing after the following travel times.

(a) 2 hours **(b)** 10 hours **(c)** 75 hours

Higher Order Derivatives

For problems 7 – 10 compute the second derivative.

7. $B(x) = \sqrt[5]{x^3} - \dfrac{1}{2x} + 9x$

8. $f(t) = \cos(4 + 3t) - 9\mathbf{e}^{5t^2}\left(5t^2\right)$

9. $y = \ln\left(1 + \mathbf{e}^{2x}\right)$

10. Compute $g^{(3)}(x)$ for $g(x) = \ln\left(15x^3\right) + \mathbf{e}^{-4x} - \sin(3x)$