

Name: _____

Group #: _____

1. For the functions $y = f(x)$ implicitly defined by the following equations, find $\frac{dy}{dx}$.

(a) $x^5 + y^5 = 1 + xy$

(b) $e^{x-y} = 2xy$

(c) $\sin\left(\frac{y}{x}\right) = 2x^3 - 3y^2$

2. Consider the curve defined by the equation $y + \sin y = x + \pi$. Find the equation of the tangent line to the curve at the point $(\pi, 2\pi)$.

3. For the functions $y = f(x)$ implicitly defined by the following equations, find $\frac{d^2y}{dx^2}$.

(a) $x^2 - y^2 = 1$

(b) $y + \cos y = x - \frac{\pi}{3}$

4. Find the derivatives of the following. Simplify only by canceling common factors and combining like terms as appropriate.

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

(b) $y = (\cos x)^{\sin x}$

(c) $y = \left(\frac{x+1}{x^2+1} \right)^{x^3}$