

MATH 1500 Assignment 3

Values

- [9] 1. Use the differentiation rules (not the definition of the derivative) to calculate the derivatives of the following functions.

(a) $f(x) = \sqrt{7x^4 + 3x^2}$ (b) $f(x) = (e^{3x^2} + 2 \sin 4x)^5$ (c)

$f(x) = \sqrt{2x + \sqrt{2x}}$

- [4] 2. Given that $f(x)$ is a differentiable function and $f'(4) = 3$, find the value of $\frac{d}{dx} f(\sqrt{x})$ when $x = 4$.

- [5] 3. Use implicit differentiation to find $\frac{dy}{dx}$ in terms of x and y if $x^3y - y^3x = x$.
[cf. Section 3.6]

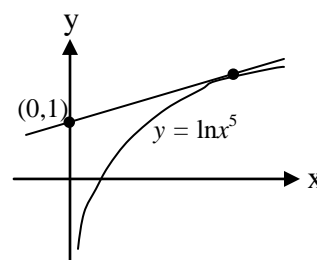
- [6] 4. Find an equation of the tangent line to the circle $x^2 + y^2 = 25$ at the point $(3, 4)$.

- [9] 5. Find the third order derivative $f'''(x)$ of $f(x) = x^2 - 3x \sin x$.

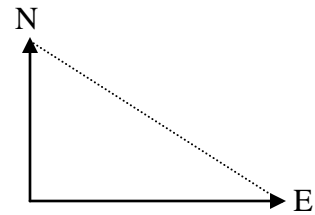
- [10] 6. Differentiate the following functions. [cf. Section 3.8]

(a) $f(x) = \ln(\sin 2x + \cos 3x)$ (b) $f(x) = (\sqrt{x} + 1) \ln(\sqrt{x} + 1)$ (c) $f(x) = x^{\cos x}$

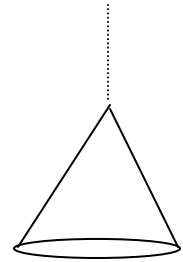
- [9] 7. The curve $y = \ln x^2$ has one tangent line that passes through the point $(0, 1)$. Find the equation of this tangent line.



- [9] 8. Two boats leave port on the same day at the same time. One travels north at 9 km/hr while the other travels east at 12 km/hr. How fast is the distance between the boats increasing 2 hours after the boats leave the port?



- [9] Sand is poured onto a level piece of ground at the rate of $0.25 \text{ m}^3 / \text{min}$. and forms a conical pile whose height is equal to its base diameter. How fast is the height increasing at the instant when the height is 0.50 m? $\left[V = \frac{1}{3} \pi r^2 h \right]$



Total = 70