

Night 4

5. $df = x^2 \sin(xy^2) dx$ $f(x) = x^2$ $g(x) = \sin(xy^2)$
 $f'(x) = 2x$ $g'(x) = y^2 \cos(xy^2)$

$$df = 2x \sin(xy^2) + x^2 y^2 \cos(xy^2)$$

$$df = x^2 \sin(xy^2) dy$$
 $f(y) = \sin(xy^2)$

$$df = 2x^3 y \cos(xy^2)$$

6. a) $\frac{d^2 f}{dx^2} = 4xy^2 \cos(xy^2) + 2 \sin(xy^2) - x^2 y^4 \sin(xy^2)$

b) $\frac{d^2 f}{dy^2} = 2x^3 \cos(xy^2) - 4x^4 y^2 \sin(xy^2)$

c) $\frac{d^2 f}{dydx} = 6x^2 \cos(xy^2) - 2x^3 y^3 \sin(xy^2)$

d) $\frac{d^2 f}{dx dy} = 6x^2 y \cos(xy^2) - 2x^3 y^3 \sin(xy^2)$

7. The mixed partial derivatives are equal for "nice" 2 dimensional functions which are continuous

8. $f(x, y, z)$ $\frac{d^2 f}{dx^2}$ $\frac{d^2 f}{dy^2}$ $\frac{d^2 f}{dz^2}$ $\frac{d^2 f}{dydx}$ $\frac{d^2 f}{dxdy}$ $\frac{d^2 f}{dzdy}$ $\frac{d^2 f}{dydz}$ $\frac{d^2 f}{dx dz}$ $\frac{d^2 f}{dz dx}$

9 2nd order derivatives

9. a) $\int_0^1 \int_0^{1-x} 1 - x - y dy dx$

b) $\int_0^1 \int_{x^2}^{\sqrt{x}} x^2 + y^2 dy dx$

11. a) $\int_0^1 \int_0^y \int_0^{-y} dx dz dy$

b) $\int_0^1 \int_0^{1-x} \int_0^{1-\sqrt{x}} dz dx dy$

I probably should have done more of the sketching and evaluating integrals by hand that I was "highly recommended" to do but sleep is good, and I have answered every question in matte match.