Math 2153, Quiz #7, Spring 2014 Name KEY

Instructions: Show all work. Use exact answers unless specifically asked to round. Be sure to complete all parts of each question.

1. Find the total differential for $z = ye^x$ at the point (0,1) and use this information to approximate the function at (0.1, 0.95).

$dz = ye^x\,dx + e^x\,dy$

$dz(0,1) = 1\,dx + 1\,dy$ $dx = .1$ $dy = -.05$

$dz \approx 1(.1) + (1)(-.05)$

$= +.05$

$z(0,1) + .05 = 1e^0 + .05 = 1.05$

2. Integrate. $\int_1^4 \int_1^{\sqrt{x}} 2ye^{-x}\,dy\,dx$

$\int_1^4 y^2 e^{-x}\Big|_1^{\sqrt{x}} dx = \int_1^4 (x-1)e^{-x}\,dx$ $u = x-1$ $dv = e^{-x}dx$ $du = dx$ $v = -e^{-x}$

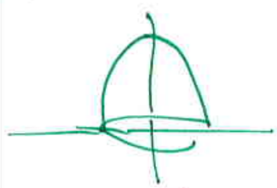
$-(x-1)e^{-x} + \int e^{-x}\,dx = -(x-1)e^{-x} - e^{-x}\Big|_1^4$

$-3e^{-4} - e^{-4} - (0 - e^{-1})$

$-4e^{-4} + e^{-1} = \frac{1}{e} - \frac{4}{e^4}$

3. Find the volume of the solid bounded by $f(x,y) = -x^2 - y^2 + 9, z = 0$. Set the integral up in rectangular and polar coordinates. Integrate the polar version.

$\int_{-3}^{3} \int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}} -x^2 - y^2 + 9\;dy\,dx$



$dy\,dx = r\,dr\,d\theta$

$x^2 + y^2 = r^2 \Rightarrow$

$r = 3$ $f(r,\theta) = -r^2 + 9$

$\int_0^{2\pi}\int_0^3 (-r^2+9)\,r\,dr\,d\theta = \int_0^{2\pi}\int_0^3 -r^3 + 9r\;dr\,d\theta =$

$\int_0^{2\pi} -\frac{r^4}{4} + \frac{9}{2}r^2\Big|_0^3 d\theta = \int_0^{2\pi} -\frac{81}{4} + \frac{81}{2}\,d\theta = \left(\frac{81}{4}\right)\theta\Big|_0^{2\pi} =$

$\frac{81}{4}\cdot 2\pi = \frac{81\pi}{2}$