Date: April 2, 2014 Wednesday   STUDENT NAME:...

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Q-1) Consider the double integral $I = \iint_D \dfrac{1}{1+y^4} \, dA$, where $D = \{(x,y) : 0 \le x \le 1, \ x \le y \le 1\}$.
   (a) Draw and shade the region D.
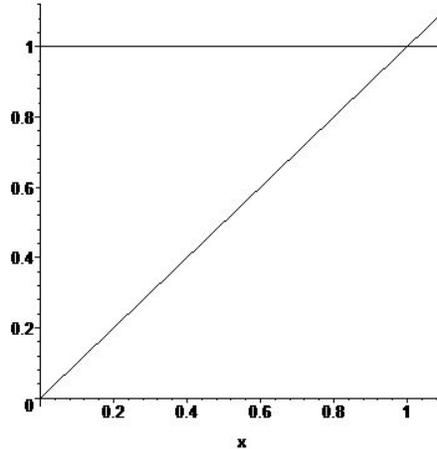
The region D is the inside of the above triangle.

   (b) Fill in the boxes below. No explanation is required.

$$I = \int_{\boxed{0}}^{\boxed{1}} \int_{\boxed{x}}^{\boxed{1}} \frac{1}{1+y^4} \, dy \, dx$$

   (c) Fill in the boxes below. No explanation is required.

$$I = \int_{\boxed{0}}^{\boxed{1}} \int_{\boxed{0}}^{\boxed{y}} \frac{1}{1+y^4} \, dx \, dy$$

   (d) Compute the integral I by using part (b) or part (c) above.

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\begin{aligned}
\int_0^1 \int_0^y \frac{1}{1+y^4} \, dx \, dy &= \int_0^1 \frac{y}{1+y^4} \, dy \\
&= \frac{1}{2} \int_0^1 \frac{du}{1+u^2}, \quad \text{after putting } u = y^2 \\
&= \frac{1}{2} \left(\arctan u \Big|_0^1 \right) \\
&= \frac{\pi}{8}.
\end{aligned}
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