Name: _____

1. Find the point on the plane $x - y + z = 4$ that is closest to the point $(1, 2, 3)$ (using max/min techniques from §15.7). Show your work.

17 pts

2. Estimate the volume of the solid that lies below the surface $z = x+2y^2$ and above the recangle $R = [0, 2] \times [0, 4]$ *using a Riemann sum with* $m = n = 2$ *and the Midpoint Rule.* (Do not use integration in your solution; you will not receive partial credit.)

15 pts

3. Change the integral $\int_{-1}^{1} \int_{0}^{\sqrt{1-y^2}} xy^2 \, dx \, dy$ to polar coordinates. **Do not evaluate the integral.**

16 pts

4. Consider the solid under the surface $z = xy$ and above the triangle D in the xy-plane with vertices at $(1, 1)$, $(4, 1)$, $(1, 2)$.

18 pts

(a) Set up **but do not evaluate** an integral for the volume of the solid.

(b) If you treated D as a Type I region in (4a), then set up the integral a different way: treating D as a Type II region. Conversely, if you treated D as a Type II region in (4a), then set up the integral a different way: treating D as a Type I region.

Name: _____

5. Find the (exact) *surface area* of the part of the plane $z = 2 + 3x + 4y$ that lies above the rectangle $[0, 5] \times [1, 4]$.

16 pts

6. Evaluate (exactly) $\iiint_E 6xy \; dV$, where E lies under the plane $z = 1 + x + y$ and above the region in the xy-plane bounded by the curves $y = \sqrt{x}$, $y = 0$, and $x = 1$.

18 pts