Math 2415

Paper Homework #5

1. **[13.2 & 13.3: Calculus on Curves]** Let C be the curve parametrized by

$$\mathbf{r}(t) = t\sin t\,\mathbf{i} + t\cos t\,\mathbf{j} + \sqrt{3}\mathbf{k} \qquad \text{for } 0 \le t \le 4\pi.$$

   (a) Sketch the curve.

   (b) Find the velocity vector at $t = 0$.

   (c) Find the acceleration vector at $t = 0$.

   (d) Parametrize the tangent line to C at $t = 0$.

   (e) Calculate the length of C.

2. **[14.1: Functions of Several Variables]** Match the functions $z = f(x, y)$ with the surfaces representing their graphs. **Provide a written explanation for your answers.** (The origin is in the middle of each box. The figures only show that portion of the surface that is inside a box.)

   (a) $f(x, y) = x^2 + y^2$

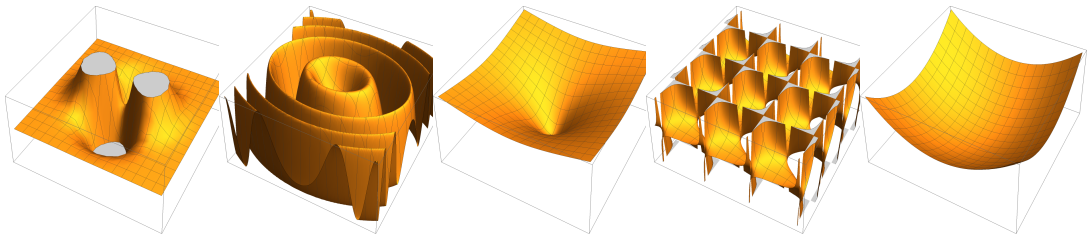
   (b) $f(x, y) = x^2 + x^3y^2$

   (c) $f(x, y) = (x^2 - y^2)\exp(-x^2 - y^2)$

   (d) $f(x, y) = \sin(x^2 + 2y^2)$

   (e) $f(x, y) = x^2\exp(-x^2) - \exp(-y^2)$

   (f) $f(x, y) = x - y$



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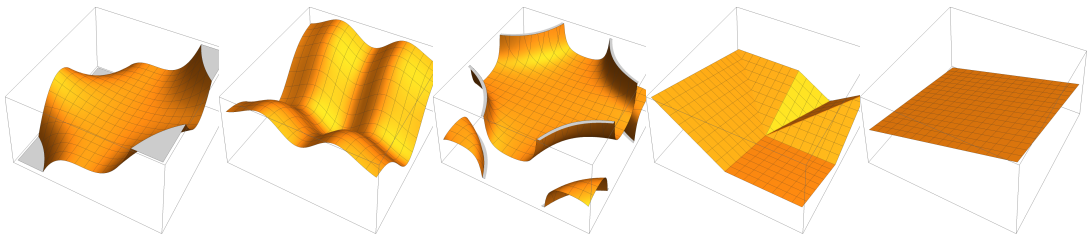

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