BROWN UNIVERSITY MATH 0350 PRACTICE MIDTERM I INSTRUCTOR: SAMUEL S. WATSON

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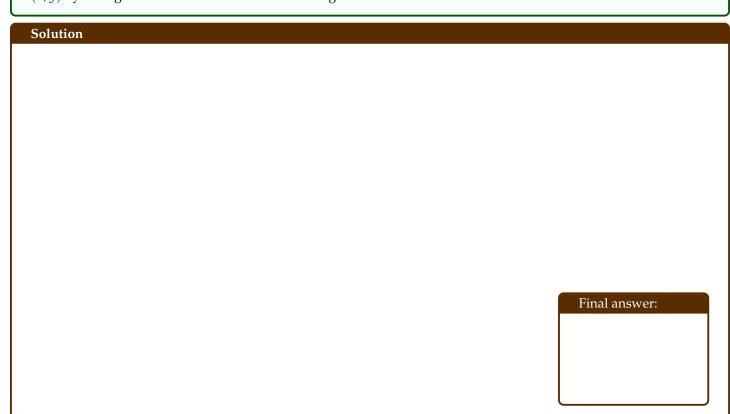
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How many hemispheres H have the property that (i) H is a subset of the unit sphere $\{(x,y,z) \in \mathbb{R}^3 : x^2 + y^2 + z^2 = 1\}$, and (ii) H is the graph of some real-valued function f defined on a subset of \mathbb{R}^2 ? Explain your answer.

Solution	
	Final answer:
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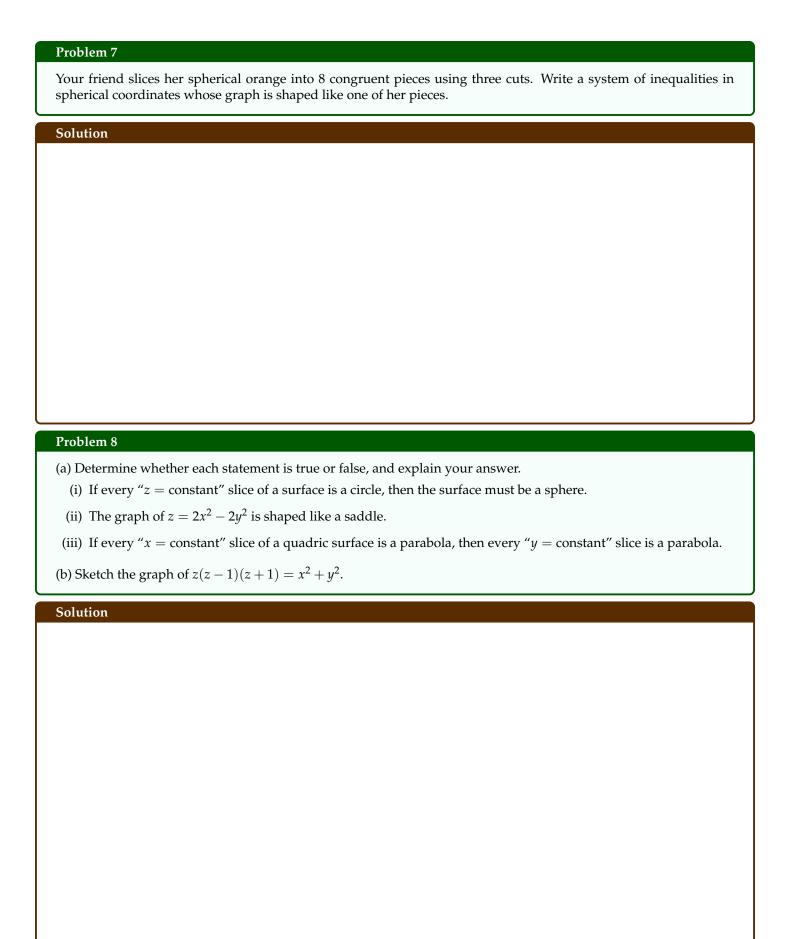
Problem 2

Suppose that f(x,y) = (ax + by, cx + dy) has the property that f(x,y) is the point obtained by rotating the point (x,y) by 42 degrees counterclockwise about the origin. Find bc - ad.



Find the distance from the plane $3x + 2y + z = 6$ to the line passing through the point $(3,4,5)$ and parallel to the vector $\langle -2,3,0 \rangle$. Solution Final answer: Final answer: Problem 4 The curve in \mathbb{R}^3 represented parametrically in \mathbb{R}^3 by $\mathbf{r}(t) = \langle t, t^2, r^3 \rangle$ is called the <i>twisted cubic</i> . Find a point on the twisted cubic at which the tangent line is parallel to the vector $\langle 4, 16, 48 \rangle$.	Solution	Problem 3
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Problem 5	
the sum of the squ	In law states that the sum of squares of the lengths of the diagonals of a parallelogram is equal to uares of the lengths of the four sides of the parallelogram. Use vectors to prove the parallelogram ent the two sides as $\bf a$ and $\bf b$, and represent the two diagonals in terms of $\bf a$ and $\bf b$.)
Solution	
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Problem 6	
Suppose that f is	a differentiable function from \mathbb{R}^2 to \mathbb{R} with the property that $f_x = 1 - 4y \sin(2x)$ and $f_y = 2\cos 2x$ nis is not enough information to approximate $f(0.1, 0.02)$.
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Suppose that <i>f</i> is (a) Explain why the (b) Approximate	his is not enough information to approximate $f(0.1, 0.02)$.
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Problem 9

Determine each of the following limits or explain why it doesn't exist.

(a)
$$\lim_{(x,y)\to(1,1)} \frac{xy}{x^2+y^2}$$

(b)
$$\lim_{(x,y)\to(0,0)} \frac{x+y^2}{x^2+y^4}$$

(c)
$$\lim_{(x,y)\to(0,0)} \frac{x^3y^2}{x^2+y^2}$$

	$(x,y) \rightarrow (1,1)$ $x + y$	$(x,y) \rightarrow (0,0) x + y$	$(x,y) \rightarrow (0,0)$ $x + y$
Solution			

Pro	a	0.550	1	n
		(2)		u

Suppose that $f: \mathbb{R}^2 \to \mathbb{R}$ is a function with the property that $f\left(\frac{1}{n}, \frac{1}{\sqrt{n}}\right) = 0$ for all positive integers n. Explain in rigorous terms why it cannot be true that $\lim_{(x,y)\to(0,0)} f(x,y) = 1$.

Solution	