

### Calculus III. Test 2 Review

Answers:

I.

1. 6 (  $g_x(1,0) = 3$  )
2. 0 Note: thus this  $\theta$  direction is perpendicular to gradient, so parallel (tangent) to level curve!  
(  $\langle 9, -3\sqrt{3} \rangle$  )
3. 3 ( $D = 27$ )
4.  $z + y = \pi$  (  $\langle 0, -1, -1 \rangle$  )
5.  $\frac{3}{2}$  (  $\langle \frac{3}{2}, 0 \rangle$  )
6.  $\frac{1}{2}$  (  $\langle \frac{3}{2}, 0, -1 \rangle$  )
7. 1 , saddle

II.

1.  $\langle 5, -2 \rangle$
2.  $\frac{4}{\sqrt{13}}$
3.  $-\sqrt{29}$
4.  $z = 2$
5. min
6. 5 (for  $z = f(x, y)$ )
7. 8 (for  $z = f(x, y)$ )

III.

1. (0,0) is a saddle; (0,-2) is a max
2.  $D = 12$ , min
3.  $\pi - 1$
4.  $e^{16}$  is a max;  $e^{-16}$  is a min.
5. 81 is a max;  $1/81$  is a min.
6. 2
7.  $\frac{32}{3}$
8.  $e^2 + 1$
9.  $\frac{e^4 - 1}{4}$
10.  $\langle -3, 1 \rangle$ ; -3