MATH 212 Fall 2014 (Buckmire)
Exam 1 Study Guide I Answers

(1) $2x^5$
(2) Note: the y>-1 sections are halves of hyperbolas, yuckers.
(3) $f(x,y,z) = z - \sqrt{x^2 + y^2}$. There are infinitely many correct answers, such as $f = z - \sqrt{x^2 + y^2} + 47$, $f = \sqrt{x^2 + y^2} - z$, and $f = 47z - 47\sqrt{x^2 + y^2}$.
(4) The distance is $\sqrt{14} - 1 - \sqrt{5} \approx .506$. This is the distance between the centers of the two sphere, i.e. between (0,2,-3) and (3,0,-2) with the two radii subtracted.

(5) Tangent plane: $z = 5 + 5(x-2) + 2(y-1)$

(6) The contours are parabolas symmetric about the *x*-axis.

(7) I used $R = (1,0,0)$, and got the plane $z = 3 - \frac{1}{3}(x-1) + \frac{3}{2}(y-2)$. Your answer will of course depend on the third point you chose.
(8) Tan plane: $z = 3 - (x+1) + 5(y-2)$
$f(-.5, 1.6) \approx .5$
(9) For example, f(x,y) is the amount of money (in dollars) you'll find lying on the streets of Snarfville tomorrow, if x other people are looking for money and you're willing to wander around for y hours.
(10) Holy monkey, I'm not typing that.
(11) $$f_y = \lim_{h\to 0} \frac{f(x,y+h) - f(x,y)}{h} = \lim_{h\to 0} \frac{[x^2(y+h)^2 + 3] - [x^2y^2 + 3]}{h}$$
$$= \lim_{h\to 0} \frac{x^2y^2 + 2x^2yh + x^2h^2 - x^2y^2}{h} = \lim_{h\to 0} \frac{h(2x^2y + x^2h)}{h} = \lim_{h\to 0}(2x^2y + x^2h)$$
$$= 2x^2y$$
(12) Northwest, northeast, southwest, and very slightly to the west of north
(13) $\left(\frac{2}{\sqrt{44}}, \frac{-2}{\sqrt{44}}, \frac{-6}{\sqrt{44}}\right)$
(14) The normal to the surface is grad F where $F(x,y,z)=x+y^2-z=0$ which is the vector **i+2j-k**. The tangent plane is $x+2y-z=1$.

(15) A plane normal to the previous plane will have a vector orthogonal to **i+2j-k** which will lay in the original plane. I choose the vector **2i-j**which is the normal for the plane $2x-y=1$.