Math 323 - Final Review Answers - Spring 25

1.) $2x - 4y - 5z = 1$

2.) $x = 5 - 16t,\ y = 2 - 14t,\ z = 4 + 5t$

3.) (a.) $f_x(x,y) = \frac{y^3 - x^2y^2}{(x^2+y)^2},\ f_y(x,y) = \frac{2x^3y + xy^2}{(x^2+y)^2}$

(b.) $f_x(x,y,z) = y\tan^{-1}(y^2z),\ f_y(x,y,z) = x\tan^{-1}(y^2z) + \frac{2xy^2z}{1+y^4z^2},\ f_z(x,y,z) = \frac{xy^3}{1+y^4z^2}$

4.) $19/5$

5.) $4x - 5y - z = 4$

6.) (a.) local max. value of $\frac{125}{27}$ at $(-\frac{5}{3}, 0)$
local min. value of 0 at $(0,0)$
saddle points at $(-1,2)$ and $(-1,-2)$

(b.) local max. value of 1 at $(1,1)$
saddle points at $(0,0)$, $(0,3)$, and $(3,0)$

7.)(a.) max. value of 4 at $(2,1)$ and $(-2,1)$
min. value of -4 at $(2,-1)$ and $(-2,-1)$

(b.) max. value of 70 at $(1,3,5)$
min. value of -70 at $(-1,-3,-5)$

8.)(a.) $\frac{3}{10}$

(b.) $\frac{1}{6}(e^9 - 1)$

9.)(a.) $\frac{65}{28}$

(b.) $\frac{16\pi}{3}$

(c.) $\frac{1}{144}$

10.)(a.) $\frac{486\pi}{5}$

(b.) $\frac{1562\pi}{15}$

(c.) $-\frac{\pi}{16}$

11.)(a.) $f(x,y) = x\sin(xy)$

(b.) $f(x,y,z) = yz^3 - x^2z + x^2 + xy - z^2 + y$

12.)

(a.) $\frac{236\sqrt{21}}{15}$

(b.) $\frac{16384}{315}$

(c.) $\frac{6}{5} - \sin(1) - \cos(1)$

(d.) 48

(e.) $\frac{2}{3}$

(f.) -24π

(g.) $\frac{4-6\pi}{3}$

13.) $12x - 4y + 7z + 28 = 0$

14.)

(a.) $\frac{4\pi}{7}$

(b.) $-\frac{4\pi}{3}$

(c.) 3

(d.) 9π

(e.) -1

(f.) $\frac{32\pi}{3}$

(g.) $\frac{8\pi}{5}$