HW 14.6 – 14.7 | 10/11/20

14.6

1. a) $f_x = 2xy^3$ $f_y = 3x^2y^2$ $f_z = 4z^3$
   b) $x_s = 2s$ $y_s = t^2$ $z_s = 2st$
   c) $(2xy^3)(2s) + (3x^2y^2)(t^2) + (4z^3)(2st) = \boxed{7s^4t^4 + 8s^7t^4}$

3. $\frac{\partial f}{\partial s} = (y)(2s) + (x)(2r) + (2z)(0) \rightarrow \boxed{6rs^2}$
   $\frac{\partial f}{\partial r} = (y)(0) + (x)(2s) + (2z)(2r) \rightarrow \boxed{2s^3 + 4r^3}$

5. $\frac{\partial g}{\partial u} = (-\sin(x-y))(3) - (-7)(-\sin(x-y)) \rightarrow \boxed{-10(10u - 20v)}$
   $\frac{\partial g}{\partial v} = (-\sin(x-y))(-5) - (-\sin(x-y))(15) \rightarrow \boxed{20\sin(10u - 20v)}$

7. $\frac{\partial F}{\partial y} = (e^{u+v})(0) + (e^{u+v})(x) \rightarrow \boxed{xe^{x^2+xy}}$

15. $\frac{\partial z}{\partial u} = (2x)(e^u \cos v) + (-2y)(e^u \sin v) \Rightarrow \boxed{2\cos 2}$

27. $f_x = 2xy + z^2$ $f_z = y^2 + 2xz \rightarrow \boxed{-2xy + z^2 / 2xz + y^2}$

29. $\frac{\partial z}{\partial y} \rightarrow f_y = xe^{xy} + 1$ $f_z = x\cos xz \rightarrow \boxed{xe^{xy+1} / x\cos(xz)}$

31. $\frac{\partial w}{\partial y}$ $f_y = (w^2+y^2)^{-2}2y$ $f_z = 2w(w^2+x^2)^{-2} + 2w(w^2+y^2)^{-2} \rightarrow \boxed{-1/2}$

14.7

1. At $(0,0) \rightarrow$ saddle point $(2\sqrt{2}, \sqrt{2})$, $(-2\sqrt{2}, -\sqrt{2})$ value -4 minima

3. $f_x = 2x + y$ $f_y = 32y^3 - 6y - 3y^2$ $f_{xx} = 2$ $f_{xy} = 1$ $f_{yy} = 96y^2 - 6 - 6y$
   $(0,0)$ saddle, $(13/64, -13/32)$ local minima

5. $f_x = y^2 - 2xy + y$ $f_y = 2xy - x^2 + x$ $f_{xx} = -2y$ $f_{yy} = 2x$ $f_{xy} = 2y - 2x + 1$
   $(0,0)$ $(1,0)$ $(0,-1)$ saddle, $(\frac{1}{3}, -\frac{1}{3})$ local min

7. $f_{xx} = 2$ $f_{yy} = 2$ $f_{xy} = -1$ $D > 0$ $(-\frac{2}{3}, -\frac{1}{3})$ local min

HW 14-6 - 14.7 | due 10/11/20

11. $f_{xx} = -18x$ $f_{yy} = -4x$ $f_{xy} = -4y$
$(0, \pm\sqrt{2})$ saddle $(\frac{2}{3}, 0)$ local max $(-\frac{2}{3}, 0)$ local min

13. $f_x = 4x^3 - 4y$ $f_{xx} = 12x^2$ $f_y = 4y^3 - 4x$ $f_{yy} = 12y^2$ $f_{xy} = -4$
$(0,0)$ saddle, $(1,1)$ $(-1,-1)$ local min

19. $f_x = \frac{1}{x} - 1$ $f_{xx} = -\frac{1}{x^2}$ $f_y = \frac{2}{y} - 4$ $f_{yy} = -\frac{2}{y^2}$ $f_{xy} = 0$
$(1, \frac{1}{2})$ local max

21. $f_x = \frac{1}{x+y}$ $f_{xx} = \frac{1}{(x+y)^2}$ $f_y = -2y - \frac{1}{x+y}$ $f_{yy} = -2 + (\frac{1}{x+y})^2$
$(3/2, -1/2)$ saddle

23. Review ~~8~~ confusing

29. Test for all end values of the bounds
$0 \le x \le 1$ and $0 \le y \le 1$ → Glob. Max. 2 Glob Min 0

35. $f_x = -2x - y + 1$ $f_{xx} = -2$ $f_y = 1 - 2y - x$ $f_{yy} = -2$ $f_{xy} = -1$
Max Val = 1/3