Solution Set of Assignment-1

1. (a) $x_{min} = 0,\ x_{max}$ *does not exist*
   (b) $x_{min} = \frac{3\pi}{2},\ x_{max} = \frac{\pi}{2}$
   (c) $x_{min} = 0,\ x_{max} = \pm 2$
   (d) $x_{min} = -1,\ x_{max}$ *does not exist.*
   (e) $x_{min} = 0,\ x_{max} = 3$
   (f) $x_{min} = 2,\ x_{max} = 0$
2. (a)convex, (b)convex, (c)not convex, (d)not convex
3. (a)Yes, (b)Yes, (c)Yes, (d)No, (e)Yes
4. (a)cl=[0,1], Int=(0,1)
   (b)cl=$\{(x,y) :\ x^2 + y^2 \leq 1\},\ Int = \{(x,y) :\ x^2 + y^2 < 1\}$
   (c)cl=A, Int=$\emptyset$
   (d)$cl = \{(x,y) :\ x \geq 0, y \geq 0\},\ Int = \{(x,y) : x > 0, y > 0\}$
5. (a)conv(A)=A, (b)conv(A)=[0,2]
   (c)conv(A)=$\{(x,y) : x \geq 0, y \geq 0\}$ (d)conv(A)=$\{(x,y) :\ x^2 + y^2 \leq 1\}$
6. (a)T, (b)T, (c)F, (d)T
7. (a) F, (b) F, (c) F, (d) T, (e) T, (f) F, (g) F, (h) T,
8. (a)F, (b)F, (c)T, (d)F, (e)F, (f)F,
9. (a)$\{0\}$, (b)$(-\infty, 0]$
10. (a)T, (b)T, (c)F, (d)T, (e)T, (f)T, (g)F, (h)T
11. (a)$f^{'}(o,v) = |v|$
    (b)$f^{'}((1,1),v) = \langle v, b\rangle$
12. (a)F, (b)F, (c)T, (d)F, (e)T, (f)T
13. (a)$N_C(x_0) = \lambda x_0,\ \lambda \geq 0$
    (b)$N_C((1,1)) = \{(x,y) : x \geq 0, y \geq 0\}$
    (c)$N_C(1) = [0, \infty]$
    (d)$N_C((0,0)) = \{(x,y) : x = 0\}$

14. (a)T, (b)T, (c)T

15. (a)N, (b)Y, (c)N, (d)Y

16. (a)T, (b)T, (c)T, (d)F

17. (a)T, (b)F, (c)T, (d)T, (e)F (f)F

18. (a)$x^{*2}/2$,
    (b)$\|x^*\|^2/2$
    (c)$\sigma_C(x)$

19. (a)T, (b)F, (c)T

20. (a)Polytope
    (b)Vertices of the set
    (c)Boundary
    (d)$x = x_1 = x_2$