MATH 111 EXAM II REVIEW ANSWERS

1. (a) $TC(q) = 2.8q + 1120$; (b) $q = 34.78$ Objects; (c) \$2.80 per Object; (d) $q = 136.585$ Objects
2. (a) $q = 49.05$ and $q = 1630.95$ Things; (b) $q = 840$ Things; (c) \$62,560;
   (d) $MC(q) = 0.2q + 2.1$; (e) $q = 189.5$ Things
3. (a) $\dfrac{A(5+h) - A(5)}{h} = -0.15h + 7.5$; (b) $B(t) = 0.75t$; (c) $t = 81.67$ minutes
4. (a) 15 feet; (b) 24 feet; (c) from 0 to 1.5 seconds
5. (a) $MR(q) = -4q + 16$ \$/Item; (b) SDP=7 \$/Item
6. (a) $\dfrac{f(x+5) - f(x)}{5} = -2x + 7$; (b) from $x = 1.5$ to $x = 2.4$; (c) $x = 7.25$
7. (a) 26.86 dollars per Thing; (b) $VC(q) = 0.1q^3 - 3q^2 + 35q$; $AVC(q) = 0.1q^2 - 3q + 35$;
   (c) $q = 7.58$ and 22.42 hundred Things; (d) 12.50 dollars per Thing; (e) $TR(q) = 15.75q$
8. (a) $TR(q) = 28q - 3q^2$; $VC(q) = q^3 - 9q^2 + 22q$; $TC(q) = q^3 - 9q^2 + 22q + 18$;
   $AC(q) = q^2 - 9q + 22 + \frac{18}{q}$; (b) 3922.40 dollars;
   (c) $q = 2.44$ hundred Things to $q = 6.56$ hundred Things; (d) 1.75 dollars per Thing
9. (a) $x = 0.19$ or 7.15; (b) $x = 3$ to $x = 5$; (c) 18.17; (d) $h(x) = x^2 - 14x + 58$; (e) $x = 7$, $y = 9$
10. (a) $x = 0.5$ and $x = 5$; (b) from $x = 2.5$ to $x = 3$; (c) at $x = 12$
11. (a) $p(q) = -0.01q + 3$; (b) $TR(q) = -0.01q^2 + 3q$; $TC(q) = 1.50q + 30$;
    (c) $MR(q) = -0.02q + 2.99$; (d) Max profit is 26.25 dollars.
12. (a) 8.6 dollars; (b) $b = 16$; (c) BEP=12.32 dollars per Item
13. (a) $TR(q) = 15q$; (b) $q = 1.1492$ hundred Gizmos; (c) $MC(3) = 0.1051$ hundred dollars;
    (d) Max profit is 22.5625 hundred dollars.
14. (a) at 2 hours; (b) from $t = 0.59$ to $t = 3.41$ hours; (c) $D(t + 0.5) - D(t) = 43.75 - 25t$;
    (d) $t = 0.75$ hours
15. (a) $ATS_A(t) = t^2 - 7t + 20$; $ATS_B(t) = 70 - 2t$; (b) $t = 0.73$ hours; (c) $t = 22.5$ hours;
    (d) smallest ATS value for Car A is 7.75 mph; smallest ATS value for Car B is 30 mph
    (e) $\dfrac{D_B(t+2) - D_B(t)}{(t+2) - t} = 66 - 4t$ mph
16. (a) $VC(q) = \frac{1}{3}q^3 - 5q^2 + 19q$; $TC(q) = \frac{1}{3}q^3 - 5q^2 + 19q + 2$; $AC(q) = \frac{1}{3}q^2 - 5q + 19 + \frac{2}{q}$;
    (b) $q = 6.87$ hundred Items; (c) 0.25 dollars per Item
17. (a) $MR(q) = 19.99$; $MC(q) = 9.50$; $TR(q) = 19.99q$; $TC(q) = 9.50q + 250$;
    (b) $q = 29$ Umbrellas; (c) $q = 50$ Umbrellas
18. (a) 18 hundred dollars; (b) from 254 to 946 Widgets; (c) SDP=0.5 dollars per Widget
19. (a) $MR(q) = -0.28q + 13.86$; (b) $0.01q^3 - 0.61q^2 + 5.75q + 85 = 0$; (c) \$5.69 per Trimble

20. (a) $TR(q) = 20.10q - 0.1q^2$; (b) from $q = 0$ to $q = 100.5$ thousand Quipples;
(c) $TC(q) = 2q + 5$; (d) 17 thousand dollars; (e) 90.5 thousand Quipples

21. (a) $q = 5.3$ hundred Items; (b) $q = 4.43$ hundred Items; (c) $q = 4$ hundred Items;
(d) \$0.65 per Item

22. (a) $a = 1$, $c = 3$; (b) 1.5; (c) $\dfrac{f(1+h) - f(1)}{h} = h$; (d) $x = \frac{16}{3}$

23. (a) $G(x, y) = 0.12x + 0.1y$; (b) $x + y \leq 16$ and $30x + 15y \leq \$300$;
(c) Vertices: $(0, 0)$, $(0, 16)$, $(10, 0)$, $(4, 12)$; (d) 1.68

24. You need to maximize the objective function $S(x, y) = 12x + 10y$, subject to the constraints $30x + 24y \leq 1098$ and $y \leq 22$. The vertices of the feasible region are $(0, 0)$, $(0, 22)$, $(19, 22)$, $(36.6, 0)$. To maximize the number of servings, $x = 19$ boxes and $y = 22$ boxes, for a maximum of 448 servings.

25. (a) The vertices are $(0, 0)$, $(0, 400)$, $(200, 0)$, $(100, 400)$, and $(200, 200)$;
(b) minimum value = 200; maximum value = 1600

26. (a) $R(x, y) = 20x + 12y$; (b) Vertices are $(0, 0)$, $(0, 15)$, $(10, 0)$, and $(1.18, 14.12)$; (c) \$200

27. The vertices are $(0, 10)$, $(0, 8.8)$, $(4.5, 0)$, $(8.5, 0)$, and $(0.8, 5.92)$. The smallest value of $P(x, y)$ is 22.5; the largest is 42.5.

28. (a) $(92, 45)$; (b) $(12, 32)$

29. (a) $x = 2.92$; (b) $x = 0.77$; (c) $x = 0.04$; (d) $x = 4.02$

30. $A = 4.2$; $k = 0.02$; $f(100) = 31.03$ or 31.04

31. $\dfrac{f(x+h) - f(x)}{h} = -4x - 2h + 10$