Finding Area Between Curves
Homework Problems

1. The velocity of a car in mph is given by $v(t) = 30t - 10t^2$ where t is in hours. Approximate the distance traveled during the first 3 hours ($t = 0$ to $t = 3$. using $\Delta = 0.5$. (*Find the left and right sums, then average them*).

2. Sketch the region bounded by the graphs of the following functions and approximate the area of the region in the indicated: (*Find the left and right sums, then average them*)

   a. $y = 4 - x^2$, x-axis. in $[0, 2]$ using $n = 4$.

   b. $y = x^2 - 2x - 3$, x-axis in $[0, 2]$ using $\Delta = 1$

For problems #3 - 15, sketch the region bounded by the graphs of the following functions. Write the definite integral needed to compute the Total Area. (*No need to find the final answer*).

3. $y = x^2$, $y = x + 2$ **4.** $y = x^2 - 1$, $y = x + 1$

5. $y = 4 - x^2$, x-axis   **6.** $y = 4 - x^2$, $y = x^2 - 1$

7. $y = x^3$, $y = x^2$ **8.** $y = x^2 + 1$, $y = x - 2$, $x = -1$, $x = 2$

9. $y = x^2$, $y = 2x$ **10**. $y = 2x - 1$, $y = x^2 - 4$

11. $y = 2x - 1$, $y = x^2 - 4$, $x = 1$, $x = 2$ **12**. $y = \sqrt{x}$, $y = x$

13. $y = x^2 - 1$, x-axis   **14**. $y = x^2 + x - 6$, x-axis,

15. $y = x^2 - 9$, x-axis in $[-2, 1]$

For problems #16 - 25, sketch the region bounded by the graphs of the following functions. Show where the graphs cross the x-axis, or each others. Write the definite integral needed to compute the Total Area. (*No need to find the final answer*).

16. $y = x^2 - 4$, x-axis in $[0, 4]$ **17**. $y = x^2 - 2x$, x-axis , $x = -1$, $x = 1$

18. $y = 3x^2$, $y = 1 - x^2$ in $[0, 1]$ **19**. $y = x^3 - 2x$, $y = x^2$

20. $y = x^3 - 4x$, $y = 5x$ **21**. $y = x^2 - 2x$, $x = 0$, $x = 6$

22. $y = x^2$, $y = \sqrt{x}$ in $[0, 2]$ **23**. $y = x^3$, x-axis in $[-1, 1]$

24. $y = x^3 - 3x + 3$, $y = x + 3$ **25**. $y = 4 - x^2$, x-axis in $[-2, 3]$

<u>Answers:</u>

1. 43.75

2. a. 5.25   **b.** 7

The final answers for problems 3 - 25 are given for information only, but will be needed for section 7.3 homework. It is helpful to use the program Grahmatica to <u>check</u> your graphs. You must find the intersection points <u>manually</u>.

3. $A = \int_{-1}^{2} (-x^2 + x + 2)dx = 4.5$

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5. $A = \int_{-2}^{2} (4 - x^2)dx = 10.67$

6. $A = \int_{-1.58}^{1.58} (-2x^2 + 5)dx = 10.54$

7. $A = \int_{0}^{1} (x^2 - x^3)dx = \frac{1}{12}$

8. $A = \int_{-1}^{2} (x^2 - x + 3)dx = 10.5$

9. $A = \int_{0}^{2} (2x - x^2)dx = 1.33$

10. $A = \int_{-1}^{3} (-x^2 + 2x + 3)dx = 10.67$

11. $A = \int_{1}^{2} (-x^2 + 2x + 3)dx = 3.67$

12. $A = \int_{0}^{1} (\sqrt{x} - x)dx = 0.167$

13. $A = \int_{-1}^{1} (-x^2 + 1)dx = 1.33$

14. $A = \int_{-3}^{2} (-x^2 - x + 6)dx = 20.83$

15. $A = \int_{-2}^{1} (9 - x^2)dx = 24$

16. $A = \int_{0}^{2} (-x^2 + 4)dx + \int_{2}^{4} (x^2 - 4)dx = 16$

17. $A = \int_{-1}^{0} (x^2 - 2x)dx + \int_{0}^{1} (2x - x^2)dx = 2$

18. $A = \int_{0}^{1/2} (1 - 4x^2)dx + \int_{1/2}^{1} (4x^2 - 1)dx = 1$

19. $A = \int_{-1}^{0} (x^3 - 2x - x^2)dx + \int_{0}^{2} (x^2 - x^3 + 2x)dx = 3.08$

20. $A = \int_{-3}^{0} (x^3 - 9x)dx + \int_{0}^{3} (9x - x^3)dx = 40.5$

21. $A = \int_{0}^{2} (2x - x^2)dx + \int_{2}^{6} (x^2 - 2x)dx = 38.67$

22. $A = \int_{0}^{1} (\sqrt{x} - x^2)dx + \int_{1}^{2} (x^2 - \sqrt{x})dx = 1.45$

23. $A = \int_{-1}^{0} (-x^3)dx + \int_{0}^{1} (x^3)dx = 0.5$

24. $A = \int_{-2}^{0} (x^3 - 4x)dx + \int_{0}^{2} (4x - x^3)dx = 8$

25. $A = \int_{-2}^{2} (4 - x^2)dx + \int_{2}^{3} (x^2 - 4)dx = 13$