

AP Calculus
5.4 Worksheet Day 1

All work must be shown in this course for full credit. Unsupported answers may receive NO credit.

For questions 1 – 10, use the Fundamental Theorem of Calculus (Evaluation Part) to evaluate each definite integral. Use your memory of derivative rules and/or the chart from your notes. You should start making a list of all the rules on ONE page!

1. $\int_1^4 \left(x^3 + \frac{5}{\sqrt{x}} \right) dx$

2. $\int_3^5 \frac{dx}{x}$

3. $\int_{\frac{1}{2}}^{\frac{\sqrt{5}}{2}} \frac{1}{\sqrt{1-x^2}} dx$

4. $\int_{-1}^{\sqrt{5}} \frac{1}{1+x^2} dx$

5. $\int_0^2 5^x dx$

6. $\int_{-5}^{12} 7x dx$

7. $\int_{-2}^5 6 dx$

8. $\int_{\frac{1}{2}}^{\pi} 5 \sin(x) dx$

9. $\int_0^{\frac{7}{4}} \sec^2(x) dx$

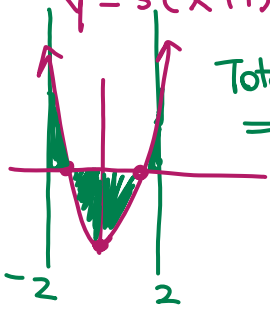
10. $\int_{-1}^3 e^x dx$

If you would like more practice with the FTOC (Evaluation part)? ... page 303 #27 – 40 (ask to borrow a book)

For questions 11 and 12, setup and evaluate an expression involving definite integrals in order to find the total AREA of the region between the curve and the x-axis. [No Calculator!]

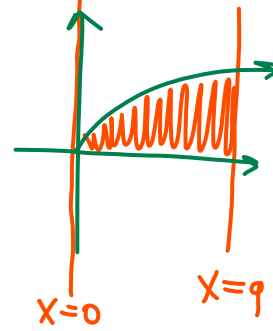
11. $y = 3x^2 - 3$ on the interval $-2 \leq x \leq 2$

$y = 3(x^2 - 1)$
 $y = 3(x+1)(x-1)$



Total Area
 $= \int_{-2}^{-1} f(x) dx + \int_{-1}^1 f(x) dx + \int_1^2 f(x) dx$

12. $y = \sqrt{x}$ on the interval $0 \leq x \leq 9$



$\int_0^9 \sqrt{x} dx$
 $\int_0^9 x^{\frac{1}{2}} dx$
 $\frac{2}{3} x^{\frac{3}{2}} \Big|_0^9$
 $= \frac{2}{3} (9)^{\frac{3}{2}} - \frac{2}{3} (0)^{\frac{3}{2}}$

For questions 13 – 16, find the average value of the function on the specified interval without a calculator.

13. $g(x) = 9 - 3x^2$ on the interval $[0, 4]$

$\frac{1}{4-0} \int_0^4 (9 - 3x^2) dx$ $9 - 16 = -7$
 $\frac{1}{4} [9x - x^3]_0^4$ $\frac{1}{4} (36 - 64)$
 $\frac{1}{4} [9(4) - (4)^3 - (9(0) - (0)^3)]$

14. $h(x) = \csc(x) \cot(x)$ on the interval $[\frac{\pi}{4}, \frac{\pi}{2}]$

15. $y = \begin{cases} 5x & \text{if } 0 \leq x \leq 2 \\ 12 - x & \text{if } 2 < x \leq 12 \end{cases}$

$\frac{\int_0^2 5x dx + \int_2^{12} (12-x) dx}{12 - 0}$

16. $f(x) = \sec^2 x$ on the interval $[0, \frac{\pi}{4}]$

$\frac{1}{\frac{\pi}{4} - 0} \int_0^{\frac{\pi}{4}} \sec^2 x dx$
 $\frac{1}{\frac{\pi}{4}} [\tan x]_0^{\frac{\pi}{4}}$
 $\frac{4}{\pi} [\tan \frac{\pi}{4} - \tan 0] = \frac{4}{\pi}$

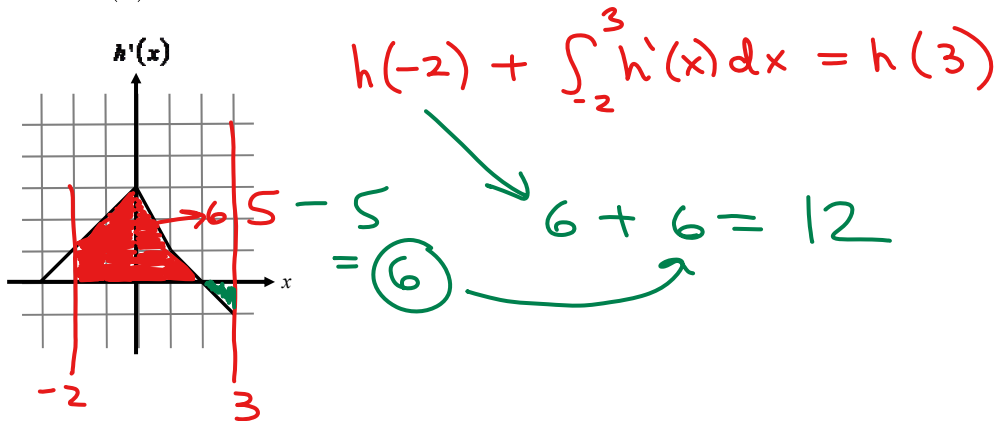
17. Including start-up costs, it costs a printer \$50 to print 24 copies of a newsletter, after which the marginal cost (in dollars per copy) at x copies is given by $C'(x) = \frac{2}{\sqrt{x}}$. Find the total cost of printing 2500 newsletters.

18. If you know $\int_{-7}^9 f'(x) dx = 15$, and you know $f(-7) = 4$, what does $f(9) = ?$

$$f(-7) + \int_{-7}^9 f'(x) dx = f(9)$$

$$4 + 15 = 19$$

19. The graph of $h'(x)$ is given below. If $h(-2) = 6$, what does $h(3) = ?$



20. The graph of $B'(x)$ is given below. If you know that $B(0) = 5$, what does $B(5) = ?$

