1. Find f if $f''(x) = 12x^2 - 8x + 2$, $f(1) = 1, \quad f(2) = 0$.

2. Find the average value of $f(x) = \dfrac{3}{(1+2x)^2}$ on the interval $[1, 5]$.

3. Using complete sentences, state the definition of the definite integral. Please be sure to include all important details.

4. Given the graph of f be able to evaluate an integral by interpreting it in terms of areas.

5. Use Part I of the Fundamental Theorem of Calculus to find the derivative of

$$h(x) = \int_{x^2}^{0} \sqrt{1+r^3}\, dr.$$

6. Evaluate the following integrals, if they exist. If they do not exist, tell why.

   (a) $\displaystyle\int_1^2 \frac{dx}{(3-5x)^2}$

   (b) $\displaystyle\int_8^{27} \frac{(\sqrt[3]{x}-1)^4}{\sqrt[3]{x^2}}\, dx$

   (c) $\displaystyle\int \left(5x^{-1/3} + 2\sin x + \csc^2 3x\right)\, dx$

   (d) $\displaystyle\int \sec^3 4x \tan 4x\, dx$

   (e) $\displaystyle\int \frac{y^4 - 2y^2 - 1}{\sqrt{y}}\, dy$

   (f) $\displaystyle\int (x+2)\left(3x^2 + 12x + 5\right)^8\, dx$

7. Find the area bounded by the curves $y = x + 1$, $y = (x-1)^2$, $x = -1$, and $x = 2$.

8. **SET-UP ONLY:** Find the area bounded by $y^2 = -4x$ and $y = 2x + 4$.

9. The velocity function (in meters per second) is given for a particle moving along a line. Find the distance travelled by the particle during the given time interval.

   $v(t) = t^2 + 2t - 15, \qquad 1 \le t \le 5$

ANSWERS

1. $f(x) = x^4 - \frac{4}{3}x^3 + x^2 - \frac{29}{3}x + 10$
2. $\frac{1}{11}$
3. See handout from section 5.2
4. See instructor. These are like problems #33 and #34 on page 338.
5. $-2x\sqrt{1+x^6}$
6. (a) $\frac{1}{14}$

   (b) $\frac{93}{5}$

   (c) $\frac{15}{2}x^{2/3} - 2\cos x - \frac{1}{3}\cot 3x + C$

   (d) $\frac{\sec^3 4x}{12} + C$

   (e) $\frac{2}{9}y^{9/2} - \frac{4}{5}y^{5/2} - 2y^{1/2} + C$

   (f) $\frac{1}{54}\left(3x^2 + 12x + 5\right)^9 + C$
7. $\frac{31}{6}$
8. $\int_{-4}^{2} \left(-\frac{1}{4}y^2 - \frac{y}{2} + 2\right)\, dy$
9. 32 meters