Review of Sections 4.9, 5.1, 5.2

1. Find the most general antiderivative for a function $f(x)$.

   (a) $f(x) = x^2 - 3x + 2$

   (b) $f(x) = x(12x + 8)$

   (c) $f(x) = 2x^{2/5} + 4x^{-4/5}$

   (d) $f(x) = (x - 7)^2$

   (e) $f(x) = \sec^2 x + \dfrac{4}{1 + x^2}$

(f) $f(x) = \dfrac{1 + 2x + 3x^2}{x^3}$

(g) $f(x) = 2\sin x + 3\cos x - \dfrac{1}{\sqrt{1 - x^2}}$

(h) $f(x) = 2^x + e^x$

(i) $f(x) = \dfrac{2x^2 + 5}{x^2 + 1}$

2. Find $f(x)$, if

   (a) $f''(x) = 20x^3 - 12x^2 + 6x$

   (b) $f'(x) = \dfrac{3}{1+x^2}$

   (c) $f''(x) = \dfrac{1}{x^2},\ x > 0,\ f(1) = 0,\ f(2) = 1$

3. A particle is moving with a velocity of $v(t) = 10\sin t + 3\cos t$, $s(0) = 0$, $s(2\pi) = 12$. Find the position of a particle at time t.

4. A car breaks with a constant deceleration of 16 ft/s^2, producing skid marks measuring 200 ft before coming to a stop. How fast was the car traveling when the breaks were first applied?

5. A stone is dropped from a cliff 450 ft above the ground.

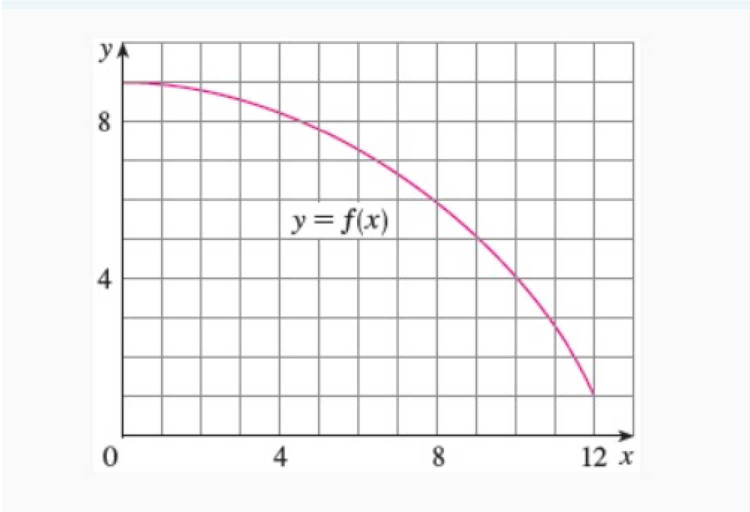
   (a) Find the height of the stone at time t.

   (b) How long does in take the stone to reach the ground?

   (c) With what velocity does it strike the ground?

   (d) If the stone is thrown down with a speed of 5 m/s, how long does it take to reach the ground?

6. Use six rectangles to find estimates of each type for the area under the given graph of f from $x = 0$ to $x = 12$.



(a) L_6

(b) R_6

(c) M_6

7. Estimate the area under the graph of $f(x) = 1 + x^2$ from $x = -1$ to $x = 2$ using three rectangles and

   (a) Right end-points

   (b) Left end-points

   (c) Midpoints

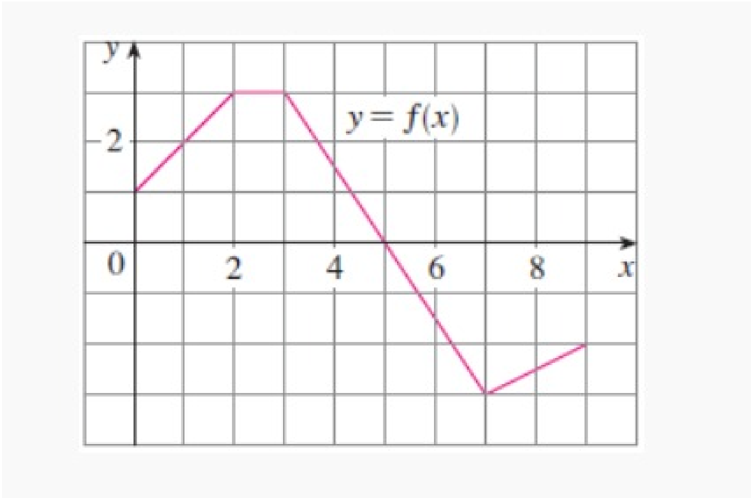
8. Find an expression for the area under the graph of $f(x) = \frac{2x}{x^2+1}$, $1 \le x \le 3$ as a limit. Do not evaluate the limit.

9. Determine a region whose area is equal to the given limit. Do not evaluate the limit.

$$\sum_{i=1}^{n} \frac{3}{n}\sqrt{1+\frac{3i}{n}}.$$

10. Express $\displaystyle\int_0^1 \frac{e^x}{1+x}\,dx$ as a limit. Do not evaluate.

11. The graph of f is shown.



Evaluate each integral by interpreting it in terms of areas.

(a) $\displaystyle\int_0^2 f(x)dx$

(b) $\displaystyle\int_0^5 f(x)dx$

(c) $\displaystyle\int_0^9 f(x)dx$

$\displaystyle\int_5^7 f(x)dx$

12. Evaluate the integral by interpreting it in terms of areas.

(a) $\displaystyle\int_{-3}^{0} \left(1+\sqrt{9-x^2}\right)\, dx$

(b) $\displaystyle\int_{0}^{1} |2x+1|\, dx$

13. Express the limit as a definite integrals

$$\lim_{n\to\infty} \sum_{i=1}^{n} \frac{1}{1+(i/n)^2}$$

Review for Exam 3.

1. Find the linear approximation for the function $f(x) = \dfrac{1}{\sqrt{x}}$ at $a = 4$.

2. Use differentials to approximate the number $(1.999)^4$.

3. Find all number(s) c that satisfy the conclusion of the Mean Value Theorem for the function $f(x) = x^3 - 3x + 2$ on the interval $[0, 2]$.

4. Find the absolute minimum value of the function $f(x) = x^3 - 6x^2 + 1$ on the interval $[-1, 1]$.

5. The function $f(x)$ is defined at all real numbers except 2 and $f'(x) = \dfrac{(x+1)(x-3)^2}{2-x}$. At what x-value(s) does $f(x)$ have a local minimum?

6. Find the x-coordinate(s) of all the inflection points for the function $f(x)$ with $f''(x) = (x^2 - x - 12)(x^2 - 4x)$.

7. Calculate the limit.

(a) $\lim_{x\to-\infty} \big(\ln(2x^2+3) - \ln(x^2+1)\big)$

(b) $\lim_{x\to1} \dfrac{1-x+\ln x}{x^2-2x+1}$

(c) $\lim_{x\to0^+} \big(3x^2+4x+1\big)^{\frac{1}{x}}$

8. The top and bottom margins of a poster are each 6 cm and the side margins are each 4 cm. If the area of printed material on the poster is fixed at 384 cm^2, find the dimensions of the poster with the smallest area.