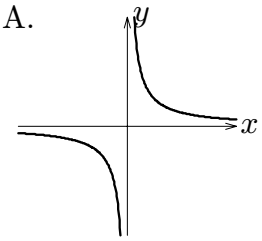
1. The function $f(x) = x^4 - 8x^3 + 24x^2 - 7\pi$ has
   A. no inflection points
   B. two inflection points at $x = 1$ and $x = 4$
   C. an inflection point at $x = 2$
   D. an inflection point at $x = 0$
   E. two inflection points at $x = 0$ and $x = 4$

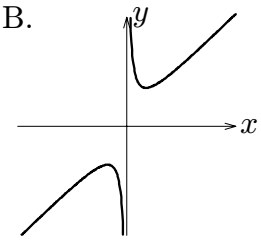
2. The limit $\lim_{x\to\infty} \dfrac{2 - 3x - 4x^2}{10 + 6x + 3x^2}$.
   A. does not exist
   B. $= 0$
   C. $= \dfrac{1}{5}$
   D. $= -\infty$
   E. $= -\dfrac{4}{3}$

3. The graph of $f(x) = x + \dfrac{4}{x}$ looks most like which graph below?

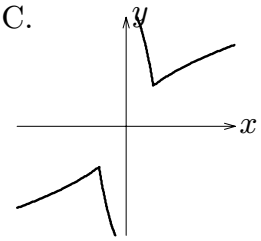
A.



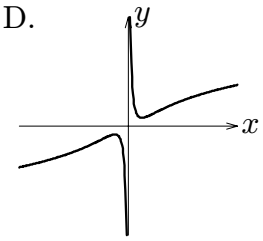
B.



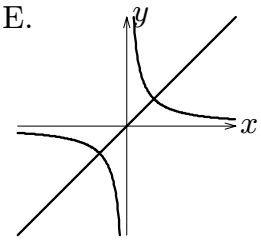
C.



D.



E.



4. The graph of $f(x) = 3x^5 - 5x^3$ is concave downward on the interval(s).

   A. $(-\infty, -\frac{1}{2}) \cup (0, \frac{1}{2})$

   B. $(-\frac{1}{2}, 0) \cup (\frac{1}{2}, \infty)$

   C. $(-\infty, -\frac{\sqrt{2}}{2}) \cup (0, \frac{\sqrt{2}}{2})$

   D. $(-\frac{\sqrt{2}}{2}, 0) \cup (\frac{1}{2}, \infty)$

   E. none of the above

5. If $f(x) = x^2 - 1$ and $P = \{-\frac{1}{2}, 0, 1, 2\}$, then the upper sum $U_f(P) =$

   A. $-\frac{11}{8}$

   B. $-\frac{3}{8}$

   C. 0

   D. $\frac{20}{8}$

   E. $\frac{21}{8}$

6. The values of a and b which guarantee that $\int_a^b f(t)dt - \int_5^3 f(t)dt = \int_3^1 f(t)dt$ are

A. $a = 5,\ b = 1$

B. $a = 4,\ b = 2$

C. $a = 2,\ b = 4$

D. $a = 1,\ b = 2$

E. $a = 3,\ b = 1$

7. If $f(x) = \begin{cases} 4, & 1 \le x \le 3 \\ 2x - 2, & 3 < x \le 4 \end{cases}$, then $\int_1^4 f(x)dx =$

A. 3

B. 8

C. 13

D. 18

E. 23

8. If $F(x) = \int_2^{x^4} \sin t^2 dt$, then $F'(a) =$

A. $a^4 \sin a^8$

B. $4a^3 \sin a^2$

C. $a^4 \cos a^2$

D. $4a^3 \cos a^2$

E. $4a^3 \sin a^8$

9. $\int_1^2 (x + \frac{1}{x})^2 dx =$

A. $\frac{31}{6}$

B. $\frac{29}{6}$

C. $\frac{23}{6}$

D. $\frac{20}{6}$

E. $\frac{17}{6}$

10. The function $F(x) = \int_0^x (\sqrt{t} - t^3)dt$ is increasing for

A. $0 < x < 1$

B. $x > 0$

C. $x > \sqrt[3]{2}$

D. $0 < x < \sqrt[3]{2}$

E. $x > 1$

11. $\int_0^{\frac{1}{2}} \frac{3x}{(x^2-1)^2}\, dx =$

A. $\frac{1}{2}$

B. $\frac{3}{4}$

C. 2

D. 3

E. 4