

1. A radioactive substance has half-life of 3 years. How much of a 100g sample remains after 8 years? Answers are in grams.

A.  $100 \left(\frac{1}{2}\right)^{8/3}$

B.  $100 \frac{\ln 1/2}{8/3}$

C.  $100 \frac{\ln 1/2}{\ln 8/3}$

D.  $100 \frac{\ln 8/3}{\ln 1/2}$

E.  $100 \left(\frac{4}{3}\right)^8$

2. If  $x^3 + y^3 = 2x + 7$  and  $dy/dt = 2$ , find  $dx/dt$  when  $x = 1$ .

A. 8

B. 2

C. -24

D. -12

E. 6

3. A street light is mounted at the top of a 12 ft vertical pole. A 5 ft woman walks away from the pole on level ground at a speed of 6 ft/s. How fast is the woman's shadow growing when she is 30 ft from the pole?

- A.  $21/6$
- B. 6
- C.  $30/17$
- D.  $30/7$
- E.  $42/5$

4. Linear approximation gives  $(15.8)^{5/4} \approx$

- A.  $31\frac{1}{3}$
- B.  $31\frac{1}{5}$
- C.  $31\frac{4}{5}$
- D.  $31\frac{3}{4}$
- E.  $31\frac{1}{2}$

5. The absolute maximum of  $f(x) = x(x - 3)$  on the interval  $[-1, 3]$  is
- A.  $-9/4$
  - B. 0
  - C. 4
  - D. 6
  - E. 10
6. Suppose  $g$  is a differentiable function on  $(-\infty, \infty)$  and  $2 \leq g'(x) \leq 6$  for all  $x$  in  $(1, 3)$ . Then  $g(3) - g(1)$  must lie in
- A.  $[2, 6]$
  - B.  $[4, 12]$
  - C.  $[1, 3]$
  - D.  $[5, 18]$
  - E.  $[-6, 6]$

7. Which is true? The function  $x - e^x$  has

- I. a local maximum at  $x = 0$
- II. a local minimum at  $x = 0$
- III. an inflection point at  $x = 0$

- A. Only I.
- B. Only II.
- C. Only III.
- D. Only I and III.
- E. Only II and III.

8. On which interval is the function  $x^4 - 2x^3 - 12x^2$  concave up?

- A.  $(-1, 2)$
- B.  $(2, \infty)$
- C.  $(1 - \sqrt{13}, 1 + \sqrt{13})$
- D.  $(-\infty, 1 + \sqrt{13})$
- E.  $(0, \infty)$

9.  $\lim_{x \rightarrow \infty} \frac{\ln(1+x)}{\ln x} =$

- A. 0
- B. 1
- C.  $e$
- D.  $\infty$
- E.  $x/(x+1)$

10.  $\lim_{x \rightarrow 0^+} \sqrt{1 + \frac{1}{x}} - \sqrt{\frac{1}{x}} =$

- A. 0
- B.  $1/2$
- C. 1
- D.  $\sqrt{2}$
- E.  $\infty$