2. Instantaneous velocity \( \approx 32 \, \text{ft/s} \)

6. Instantaneous velocity at \( t = 1 \) second \( \approx 6.2 \, \text{ft/s} \)

16. \( \text{ROC at } x = \frac{\pi}{4} \approx 0.619 \)

18. Instantaneous velocity at \( t = 3 \) second \( \approx 3.62 \, \text{ft/s} \)

22. b) the velocity of the particle is decreasing (i.e., particle is slowing down)

26. a) \% per day. (percent per day)

b) from smallest to largest average rates of infection
\[ [40, 52], [0, 12], [20, 32] \]

c) average rates of infection on the intervals 
\[ [30, 40], [40, 50], [30, 50] \] are \( .9, .5, .7 \) \% per day respectively.

d) instantaneous ROC at \( t = 40 \) = \( .55 \) \% per day

§ 2.2

2. \( -\frac{1}{2} \)

4. \( -\frac{1}{6} \)

8. a) DINE

b) limit exist.

14. 8

28. 0

32. \( \approx 0.307 \) (exact answer \( e^{-1/ln2} \))
38. \begin{align*}
\text{at } c = 1 & \quad \lim_{t \to 1^-} g(t) = 2.5 \neq \lim_{t \to 1^+} g(t) = 0.7 \\
\text{o.o. limit does not exist at } c = 1 \\
\text{at } c = 2 & \quad \lim_{t \to 2^-} g(t) = 2 \neq \lim_{t \to 2^+} g(t) = 3 \\
\text{o.o. limit does not exist at } c = 2 \\
\text{at } c = 4 & \quad \lim_{t \to 4^-} g(t) = 2 = \lim_{t \to 4^+} g(t) \\
\text{o.o. } \lim_{t \to 4} g(t) = 2 \\
\text{at } c = 5 & \quad \lim_{t \to 5^-} g(t) \approx 1.3 \\
\lim_{t \to 5^+} g(t) \approx 1.3 \text{ as well.} \\
\text{o.o. } \lim_{t \to 5} g(t) = g(5)
\end{align*}
§ 2.3

2. \(-3\)

10. \(-135\)

14. \(9\)

18. \(\frac{1}{5}\)

24. a.) 16
    b.) \(\frac{1}{4}\)
    c.) 24

30. Product rule cannot be applied because \(\lim_{x \to \pi/2} \tan x = \infty\)

§ 2.4

2. Points of discontinuity \(x = 1\)
    \(x = 3\)
    \(x = 5\).

    \(f\) is left continuous at \(x = 1\)
    \(f\) is neither left or right continuous at \(x = 3\)
    \(f\) is right continuous at \(x = 5\)
4. Jump discontinuity at $x = 1$
   but left continuous there.
   
   Let $f(1) = 3$, then $f$ is right continuous at $x = 1$
   (but no longer left continuous).

5. Sketch the graph for each subinterval.

14. $10^x$ and $\cos x$ are both continuous.

   0° by Continuity Law ii) $f(x)$ is continuous

20. $f(x) = \frac{x-2}{|x-2|}$

   So,
   
   $f(x) = \begin{cases} 
   1 & x > 2 \\
   0 & x = 2 \\
   -1 & x < 2
   \end{cases}$

   0° The functions have jump discontinuity at $x = 2$.

26. $g(+) \text{ is continuous for } t > 0$.

44. $\text{dom}(f) = \{ x \text{ s.t. } 9-x^2 > 0 \text{ i.e. } |x| < 3 \}$
   
   $9-x^2$ is a polynomial $\Rightarrow$ continuous.
   
   $\ln x$ is continuous for $x > 0$

   apply laws of continuity when composing 2 continuous functions.
58. If \( f \) is discontinuous
    \( g \) is discontinuous
    then \( f+g \) not necessarily discontinuous
    (give a counterexample.)

74. \( 3 \)

84. \( c = 2 \pi \)

2.5 4.) \( -\frac{1}{6} \)

8.) \( 8 \)

10. does not exist.
    compute the left and right-hand side
    limit & see that they are not
    equal.

\[
\lim_{x \to 2^-} f(x) = -\infty
\]

\[
\lim_{x \to 2^+} f(x) = +\infty
\]
18. $-\frac{1}{4}$

22. 1

26. 0

30. 0

32. 2

50. $\frac{1}{\sqrt{a}}$

52. $-\frac{1}{a^2}$