Answers to Problems from section 2.1:

7 (a) (i) On the interval [1,3], $v_{ave} = 4.65$ m/s; (ii) On the interval [2,3], $v_{ave} = 5.6$ m/s; (iii) On the interval [3,5], $v_{ave} = 7.55$ m/s; (iv) On the interval [3,4], $v_{ave} = 7$ m/s.

(b) Graph is omitted here. Using the points (2,4) and (5,23) from the approximate tangent line, the instantaneous velocity at $t = 3$ is about 6.3 m/s.

Answers to Problems from section 2.2:

3. (a) 2. (b) 3. (c) Does not exist. (d) 4. (e) Does not exist.

6. Limit exists for all a except $a = \pm 1$. Graph omitted.

Answers to Problems from section 2.3:

11. Does not exist.

19. $\frac{1}{6}$

22. 1.

29. Prove by Squeeze Theorem following example from lecture.

32. Since left and right limits are different, it does not exist.

Answers to Problems from section 2.4:

16. Since function value doesn't equal to limit value, f is discontinuous at 1.

21. By Theorem 5, the polynomial $t^4 - 1$ is continuous on $(-\infty, \infty)$. By Theorem 7, $\ln x$ is continuous on its domain, $(0, \infty)$. By Theorem 9, $\ln(t^4 - 1)$ is continuous on its domain, which is

$$t | t^4 - 1 > 0 = (-\infty, -1) \cup (1, \infty).$$

27. Because $x^2 - x$ is continuous on $\mathbb{R}$, the composite function $f(x) = e^{x^2 - x}$

is continuous on $\mathbb{R}$. So

$$\lim_{x \to 1} f(x) = f(1) = e^{1-1} = 1.$$

39. Follow example from lecture, use Intermediate Theorem to prove it.

Answers to Problems from section 2.5:

24. $\dfrac{1}{3}$

26. $\dfrac{a-b}{2}$

31. $-\infty$

36. Horizontal asymptote: $y = 0, y = 2$. Vertical Asymptote: $x = \ln 5$.

Answers to Problems from section 2.6:

8. $y = x + 4$

17. -24 ft/s.

Answers to Problems from section 2.7:

15. $\dfrac{5}{(a+3)^2}$

17. $-\dfrac{1}{2(a+2)^{3/2}}$

18. $\dfrac{3}{2\sqrt{3a+1}}$

19. By definition 2, $\lim_{h \to 0} \dfrac{(1+h)^{10} - 1}{h} = f'(1)$, where $f(x) = x^{10}$ and $a = 1$

Or: By definition 2, $\lim_{h \to 0} \dfrac{(1+h)^{10} - 1}{h} = f'(0)$, where $f(x) = (1+x)^{10}$ and $a = 0$

20. By definition 2, $\lim_{h \to 0} \dfrac{\sqrt[4]{16+h} - 2}{h} = f'(16)$, where $f(x) = \sqrt[4]{x}$ and $a = 16$

Or: By definition 2, $\lim_{h \to 0} \frac{\sqrt[4]{16+h}-2}{h} = f'(0)$, where $f(x) = \sqrt[4]{16+x}$ and $a = 0$