Answers to Week 8

- **Section 3.3**
  1. a) $t = 1$second; b) 8 feet
  2. $\frac{5}{18}$ g/L per second
- **Section 3.4**
  1. $\frac{4}{5}$
  2. $\frac{64}{9}$
  3. $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$
- **Section 3.5**
  1. $\frac{3\sqrt{3}}{4}$
  2. $f'(x) = \frac{1}{2}(-\sin\sqrt{x^2+1})(x^2+1)^{-1/2}(2x) = \frac{-x\sin\sqrt{x^2+1}}{\sqrt{x^2+1}}$
  3. a) 432 b) -4
- **Section 3.6**
  1. $\frac{1}{9}$
  2. $-\frac{y}{x+2y}$.
  3. at $\left(\frac{4}{5}, \frac{8}{5}\right)$: $m_1 = -\frac{4}{3}$, $m_2 = \frac{3}{4}$; at (0,0): 1st tangent is horizontal; 2nd tangent is vertical.
- **Section 3.7**
  1. velocity: $-2\mathbf{i} + 2\mathbf{j}$; speed $= \sqrt{8}$
  2. $\frac{2}{\sqrt{7}}\mathbf{i} + \frac{\sqrt{3}}{\sqrt{7}}\mathbf{j}$
- **Section 3.8**
  1. 3
  2. $(x+20)e^x$
  3. C=f, B=f', A=f''
- **Section 3.9**
  1. $y + 2 = -\frac{9}{4}(x-4)$
  2. Vertical: $(6, 12)$, $(-26, 28)$
     Horizontal: $(-26, 28)$, $(-10, -4)$
- **Section 3.10**
  1. $-\frac{81}{25}$ ft/sec
  2. 48 m/s
  3. $\frac{64}{225\pi}$ cm/sec
- **Section 3.11**
  1. $2 + \frac{1}{1000} = 2.001$
  2. $L(x) = 1 + x$
  3. $Q(x) = \frac{\sqrt{3}}{2} - \frac{1}{2}\left(x - \frac{\pi}{6}\right) - \frac{\sqrt{3}}{4}\left(x - \frac{\pi}{6}\right)^2$
- **Section 4.1**
  1. 2
  2. $f'(x) = (3x^2+1)e^{x^3+x}$, $f''(x) = (3x^2+1)^2 e^{x^3+x} + 6xe^{x^3+x}$
  3. Differentiate, substitute, and show the left hand side simplifies to 0.
- **Section 4.2**
  1. $-\frac{1}{2}$
  2. $-\frac{1}{3}$
  3. $\frac{1}{9}$