(7)(a) \( h(t) = \text{height of rocket above me after t seconds} = 10t^3 + 8t^2 \)

\( h(2) = 10(2)^3 + 8(2)^2 = 112 \) meters

This is 10 meters above ground so ground is 112 - 10 = 92 meters above me so depth of mine is 92 meters

(b) \( \text{velocity} = v(t) = \frac{dh}{dt} = 30t^2 + 16t \)

so \( v(1) = 46 \text{ m/s} \)

(c) \( \text{acceleration} = \frac{dv}{dt} = 60t + 16 \)

so \( a(2) = 60(2) + 16 = 136 \text{ m/s}^2 \)

9(a)

\[
\begin{array}{c|c|c|c|c}
\text{liters/hour} & 1 & 2 & 3 & 4 & 5 & 6 \\
\hline
\text{area} = 2000 & & & & & & \\
\text{area} = 12000 & & & & & & \\
\text{area} = 4000 & & & & & & \\
\end{array}
\]

During 6 hours \( 2000 + 12000 + 4000 = 18000 \) liters leave tank

This leaves \( 22000 - 18000 = 4000 \) liters

(b) \( \text{rate oil leaves tank} = \frac{\text{amount that leaves}}{\text{time taken}} = \frac{18000}{6} = 3000 \text{ liters/hour} \)

(c) Half empty after \( \frac{22000}{2} = 11000 \) liters have left. 2000 liters leave in first hour. Then oil leaves at rate of 4000 l/h so takes another \( \frac{9}{4} \) hours

Total time \( \frac{13}{4} \text{ hours} \)

11(a) \( f'(t) = 6 + 6t \) so \( f'(2) = 6 + 6(2) = 18 \)

(b) \( \text{av. rate of ch.} = \frac{f(2)-f(0)}{2} = \frac{12+12}{2} = 12 \)

(c) \( \text{average} = \frac{1}{2 - 0} \int_0^2 6t + 3t^2 \text{ dt} = (1/2) \left[ t^3 + \frac{3t^4}{2} \right]_0^2 = 10 \)
1 (a) \[ \log(3500^{0.4}) = (0.4) \log(3500) \]
\[ = (0.4) (\log(1000) + \log(3.5)) \]
\[ = (0.4)(3.54) \]
\[ = 1.42 \]

3500^{0.4} = \text{antilog}(1.42)
\[ = 10^{\text{antilog}(0.42)} \]
\[ = 26 \pm 2 \]

(b) \[ 2 \times 10^{0.4}w = 40 \text{ so } 10^{0.4}w = 20 \]
take logs both sides
\[ \log(10^{0.4}w) = \log(20) \]
w \[ \log(10) = \log(10) + \log(2) \]
w = 1+0.3 = 1.3 \pm 0.03

(c) (derivative of \(10^x\) at 0.8) = slope of graph at 0.8

Tangent line at \(x=0.8\)
slope = 7.3/0.5
\[ \approx 14.6 \pm 2 \]

2 (a) \[ 4x^4 + 5x + C \]

(b) \[ [6x^{1.5} / 1.5]_0^1 \]
\[ = (6/1.5) - 0 \]
\[ = 4 \]

(c) \[ x^{3/3} + b x^{1/2} + b^2 x + C \]

3 (a) \[ \frac{df}{dx} = 12x^2 - 2b x + 6 \]

(b) \[ f''(x) = 24x - 2b \]

(c) derivative increasing when when \(f''(x) > 0\)
so \(24x - 2b > 0\)
so \(x > b/12\)

4 (a) biggest difference is 25 during week 7

(b) \[ (0+5+10+15+15+20+25+15+20+10)/10 = 13.5 \]
accept either answer

(c) \[ ((100+100) - (65+70)) / 4 = 65/4 = 16.25 \]

2 pts per part also allow \(65/5 = 13\)

6 (a) \([5x / (2x^4)] = (5/2) x^{-3}\)
NOW take derivative to get
\[ \frac{d}{dx} \left( \frac{5}{2} x^{-3} \right) = -(15/2)x^{-4} \]

(b) \[ f(x) = c^2 x^2 + 2cb x + b^2 \]
\[ f'(x) = 2c^2 x + 2cb \]
\[ f''(2) = 4c^2 + 2cb \]

(c) \[ \frac{df}{dx} = 3b e^{3x} \]