1. a) \( f(x) = (2x + 1)(7 - x^2) = -2x^2 - x^2 + 14x + 7 \Rightarrow f'(x) = -6x^2 - 2x + 14 \)

b) \( y = 5\sqrt{x} + x\sqrt{x} = 5x^{\frac{3}{2}} + x^{\frac{3}{2}} \Rightarrow \frac{dy}{dx} = \frac{5x^{\frac{3}{2}}}{3} + \frac{3}{2}x^{\frac{3}{2}} = \frac{5}{3\sqrt{x^3}} + \frac{3x^2}{2} \)

c) \( g(x) = \frac{x^5 + 7}{x^2} - 0.77 = x^3 + 7x^{-2} - 0.77 \Rightarrow g'(x) = 3x^2 - 14x^{-3} = 3x^2 - \frac{14}{x^3} \)

2. a) In order: none, B, D, C, none, A

b) The slope of the secant line from \( x = s \) to \( x = s + r \) is:

\[
\frac{f(s + r) - f(s)}{r} = \frac{2sr + r}{(s + 3)(s + r)} \times \frac{1}{r} = \frac{(2s + 1)r}{(s + 3)(s + r)} \times \frac{1}{r} = \frac{2s + 1}{(s + 3)(s + r)}
\]

The slope of the tangent line at \( x = s \) is obtained from this by letting \( r \) go to zero:

\[
f'(s) = \frac{2s + 1}{(s + 3)(s)}
\]

Evaluating at \( s = 7 \):

\[
f'(7) = \frac{2(7) + 1}{(7 + 3)^2} = \frac{15}{70} \approx 0.21
\]

3. a) \( \frac{B(3.1) - B(3)}{0.1} \approx B'(3) = 0.5 \)

b) from \( t = 0 \) to \( t = 5 \) minutes

c) at \([t = 7]\) minutes

d) from \( t = 0 \) to \( t = 5 \), Balloon A is: descending, & Balloon B is: first ascending then descending

4. a) \( MR(q) = 3q^2 - 11.5q + 9.5, \quad MC(q) = \frac{6}{q} = 1.2q \) Units for both: Dollars

b) Setting \( MR = MC \) results in the equation: \( 3q^2 - 12.7q + 9.5 = 0. \)

Quadratic Formula: \( q \approx 0.97 \) and \( q \approx 3.26 \)

TR is above TC at the first one only (other one is max loss). Answer: at : \( q \approx 0.97 \) hundred trinkets

c) TR has a horizontal tangent line when \( TR'(q) = 3q^2 - 11.5q + 9.5 = 0 \)

Quadratic Formula: \( q \approx 1.2 \) and \( 2.63 \) hundred trinkets