1. Find the numerical value of the expression. Round your answer to four decimal places.

\[
\cosh (8)
\]

2. If \( \tanh x = \frac{15}{17} \), find the values of the other hyperbolic functions at \( x \).

<table>
<thead>
<tr>
<th>sinh ( x )</th>
<th>cosh ( x )</th>
<th>tanh ( x )</th>
<th>coth ( x )</th>
<th>sech ( x )</th>
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3. Find the derivative of \( F(x) \).

\[
F(x) = \sinh x \tanh x
\]

a. \( F'(x) = \sinh x \coth^2 x + \tanh x \cosh^2 x \)

b. \( F'(x) = \sinh x \coth^2 x + \tanh x \cos x \)

c. \( F'(x) = \sinh x \coth^2 x + \tanh x \cosh x \)

d. \( F'(x) = \sinh x \coth x + \tanh x \cosh x \)

4. A telephone line hangs between two poles at 14 m apart in the shape of the catenary \( y = 30 \cosh \left(\frac{x}{30}\right) - 25 \), where \( x \) and \( y \) are measured in meters. Find the slope of this curve where it meets the right pole. Round your answer to four decimal places.
5. If \( y = 2x^3 + 6x \) and \( \frac{dx}{dt} = 9 \), find \( \frac{dy}{dt} \) when \( x = 2 \).

6. Two cars start moving from the same point. One travels south at 24 mi/h and the other travels west at 57 mi/h. At what rate is the distance between the cars increasing 5 hours later? Round the result to the nearest hundredth.

Enter your answer as a number without the units.

7. The altitude of a triangle is increasing at a rate of 1 cm/min while the area of the triangle is increasing at a rate of 3 cm\(^2\)/min. At what rate is the base of the triangle changing when the altitude is 10 cm and the area is 100 cm\(^2\)?

a. – 1.4 cm/min  
   b. 8.6 cm/min

c. – 8.4 cm/min  
   d. 3.6 cm/min

e. – 0.4 cm/min  
   f. – 3.4 cm/min

8. A boat is pulled into a dock by a rope attached to the bow of the boat and passing through a pulley on the dock that is 2 m higher than the bow of the boat. If the rope is pulled in at a rate of 4 m/s how fast is the boat approaching the dock when it is 3 m from the dock? Round the result to the nearest hundredth if necessary.
9 A water trough is 20 m long and a cross-section has the shape of an isosceles trapezoid that is 30 cm wide at the bottom, 60 cm wide at the top, and has height 60 cm. If the trough is being filled with water at the rate of $0.2 \text{ m}^3/\text{min}$, how fast is the water level rising when the water is 40 cm deep? Round the result to the nearest hundredth.

a. 2.05 cm/min  

b. 2.1 cm/min  

c. 1.8 cm/min  

d. 2 cm/min  

e. 12.1 cm/min  

f. 0.93 cm/min

10 If two resistors with resistances $R_1$ and $R_2$ are connected in parallel, as in the figure, then the total resistance $R$ measured in ohms ($\Omega$), is given by $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$. If $R_1$ and $R_2$ are increasing at rates of 0.5 $\Omega$ / s and 0.3 $\Omega$ / s respectively, how fast is $R$ changing when $R_1 = 75$ and $R_2 = 135$? Round the result to the nearest thousandth if necessary.
11 Two carts, A and B, are connected by a rope 40 ft long that passes over a pulley (see the figure below). The point Q is on the floor 17 ft directly beneath and between the carts. Cart A is being pulled away from Q at a speed of 2 ft/s. How fast is cart B moving toward Q at the instant when cart A is 6 ft from Q? Round the result to the nearest hundredth.

(a) 1.06 ft/s (b) 1.55 ft/s
(c) 0.85 ft/s (d) 0.98 ft/s
(e) 1.05 ft/s (f) 2.06 ft/s

12 The turkey is removed from the oven when its temperature reaches 185°F and is placed on a table in a room where the temperature is 75°F. After 10 minutes the temperature of the turkey is 168°F and after 20 minutes it is 153°F. Use a linear approximation to predict the temperature of the turkey after half an hour.

(a) 136 (b) 130
(c) 148 (d) 128
(e) 138 (f) 139

13 Use the linear approximation of the function \( f(x) = \sqrt{2 - x} \) at \( a = 0 \) to approximate the number \( \sqrt{2.1} \).
14 Compute $\Delta y$ and $dy$ for the given values of $x$ and $dx = \Delta x$.

$$y = x^4, \quad x = 3, \quad \Delta x = 0.5$$

15 The circumference of a sphere was measured to be 89 cm with a possible error of 0.5 cm. Use differentials to estimate the maximum error in the calculated volume.

a. $\Delta V \approx 201 \text{ cm}^3$

b. $\Delta V \approx 200 \text{ cm}^3$

c. $\Delta V \approx 198 \text{ cm}^3$

d. $\Delta V \approx 199 \text{ cm}^3$