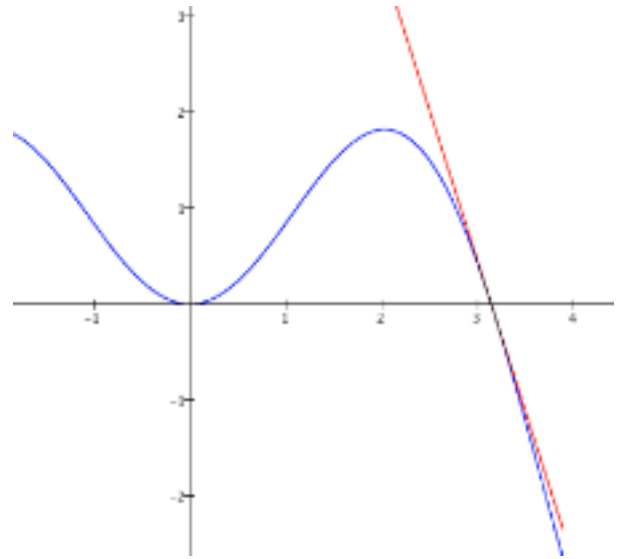


Name _____

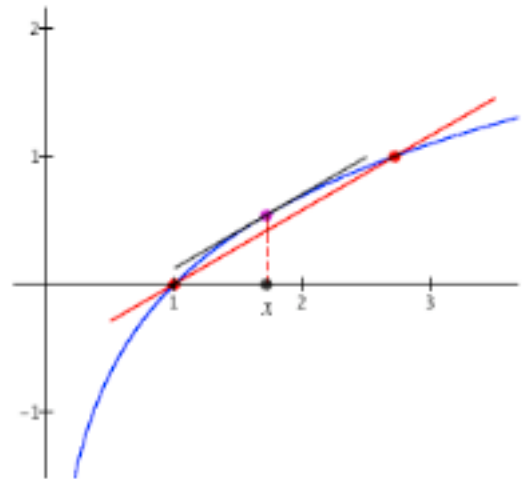
Justify all answers by showing your work or by providing a coherent explanation. Please circle your answers.

1. Find the equation of the tangent line to the curve $y = x \sin x$ at $x = \pi$.



2. Find the maximum and minimum points, and all inflection points for the function $f(x) = e^x \cos x$ on $\left[-1, \frac{\pi}{2}\right]$.

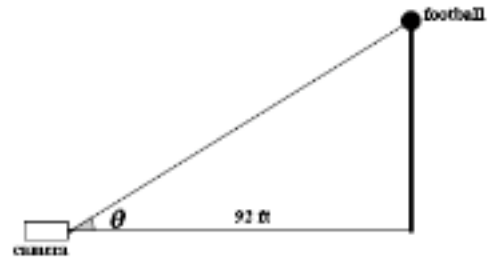
3. Use the Mean Value Theorem for $f(x) = \ln x$ on the interval $[1, e]$ to find the value for x .



4. How does the function $\frac{e^x - e^{-x}}{4 \sin x}$ behave as x gets closer to 0?

5. The radius of curvature at a point on a curve is given by $r = \frac{[1 + (y')^2]^{\frac{3}{2}}}{y''}$. A roller mechanism moves along the path defined by $y = \ln(\sec x)$. Find the radius of curvature at $x = \frac{\pi}{3}$.

6. A football is thrown horizontally (with very little arc) at 56 ft/sec parallel to the sideline. A television camera is 92 ft from the path of the football. Find the rate, $\frac{d\theta}{dt}$, at which the camera must turn to follow the ball when $\theta = 30^\circ$.



7. Two resistors with resistances r and $r + 2$ are connected in parallel. Their combined resistance ρ is related to r by the equation $r^2 = 2r\rho + 2\rho + 2r$. Find an expression for $\frac{d\rho}{dr}$.

8. The time rate of change of electric current in a circuit is given by $\frac{di}{dt} = 4t - 0.6t^2$. find the expression for the current as a function of time, $i(t)$, if $i = 2A$ when $t = 0$.

9. It is required to find the "area" under the curve $y = \frac{10x}{\sqrt{x^2 + 1}}$ from $x = 0$ to $x = \frac{1}{2}$.

10. A Y-shaped metal bracket is to be made such that its height is 10.0 cm and its width across the top is 6.0 cm. What shape will require the least amount of material? (Specify the length of the "handle", the lengths of the top sides, and the interior angle.)

(Hint: Lay it on its side and use the rule of Pythagoras)

