

1. Differentiate each of the following. It's not necessary to simplify your answers.

(a) $f(x) = \frac{3}{\sqrt{1+x+3x^2}}$

(b) $s(t) = \arctan(2t)$

(c) $y = \frac{\tan x}{1 + \cos x}$

(d) $g(x) = \ln(x + e^{-3x})$

(e) $f(x) = \frac{5}{(x^2 - 4)^3}$

(f) $y = x^{\cos x}$

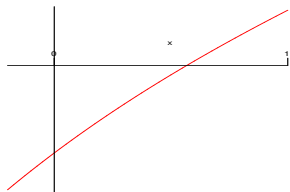
2. (a) Determine the equation of the tangent line to the curve:
 $x^2 \sin y + 3x + 2y = 6$ at the point $(2, 0)$.

- (b) Use your answer in part (a) to approximate y when $x = 2.4$

3. Find the point(s) on the parabola $y = x^2$ that is (are) closest to the point $(0, 1)$.

4. A lighthouse is 100 meters from a straight shoreline. The light turns at a rate of 10 revolutions per minute (20π radians/minute), and shines a moving spot of light along the shore. How fast is the spot of light moving when it's 100 meters from the point on the shore which is nearest the lighthouse? Be sure to include units in your answer.

5. Use Newton's Method once to estimate the solution to the equation $x = e^{-x}$. (Note that the plot of $f(x) = x - e^{-x}$ is shown below.)



6. Determine each of the following limits. Show your work.

(a) $\lim_{x \rightarrow 0} \frac{\sin x}{e^x - 1}$

(b) $\lim_{x \rightarrow 0} \frac{e^x - 1}{\cos x}$

(c) $\lim_{x \rightarrow 0} (1 + 2x)^{1/x}$