

Question 1:

(a)[7 points] Find the linear approximation to $f(x) = \sqrt{25 - x^2}$ at $a = 3$.

(b)[3 points] Use your result from (a) to approximate $\sqrt{21}$.

Question 2:

(a)[5 points] Solve for x :

$$\ln(1 + e^{-x}) = 3$$

(b)[5 points] Evaluate the limit

$$\lim_{x \rightarrow \infty} \frac{3e^{2x} - 2e^{-3x}}{2e^{2x} + 3e^{-3x} - 1}$$

Question 3:

(a)[3 points] Differentiate

$$y = e^{-5x} \cos(7x)$$

(b)[3 points] Differentiate

$$y = \log_5(xe^x)$$

(c)[4 points] Use logarithmic differentiation to find $\frac{dy}{dx}$:

$$y = \frac{x^{\cos x}}{\tan^7 x}$$

Question 4 [10 points]: Find the absolute maximum and absolute minimum values of $f(x) = \frac{4x}{x^2 + 4}$ on the interval $[0, 5]$.

Question 5: For this question use the function $f(x) = 200 + 8x^3 + x^4$.

(a)[5 points] Find the intervals of increase and decrease of f .

(b)[5 points] Find the intervals of concavity of the graph of f .