

[40] 1. Find y' if

a) $y = e^{2x} - 3e^{4x} + e$

b) $y = x \ln(x^2 + 1)$

c) $y = e^{3x} \sin 2x$

d) $y = (x^2 + 1)^{3x}$

e) $y = \sin x^2 + \sin^2 x$

f) $y^2 + 2xy - y^3 = 5$

g) $y = (4 + \sin x)^{x^2}$

h) $x \sin y + y \sin x = 2$

[10] 2. Find the equation of the line tangent to the curve $y = 2 \ln x + 1$ at $x = e$.

[20] 3. Determine each of the following limits (express the limit as ∞ or $-\infty$ if appropriate) or state that the indicated limit does not exist. Justify your answer by showing appropriate algebraic steps.

a) $\lim_{x \rightarrow \infty} [(2x + 3) - \ln(7x + 6)]$

b) $\lim_{x \rightarrow 2} \frac{(x - 1)}{(x - 2)^2}$

c) $\lim_{x \rightarrow 3} \frac{\sqrt{x + 1} - 2}{x - 3}$

d) $\lim_{x \rightarrow 0} e^{-1/x^2}$

- [10] 4. The length of a cube is given as 30 cm with a maximum error in measurement of .3 cm.
- What is the relative error of the area?
 - What is the percentage error?
- [10] 5. Two cars start moving from the same point. One travels south at 60 mph and the other travels west at 25 mph. At what rate is the distance between the cars increasing two hours later?

- [7] 6. If $f'(x) = (x - 1)(2 - x)(x + 3)^2$ draw a sign chart to indicate where f is increasing ($f' > 0$) and f is decreasing ($f' < 0$).

- [7] 7. Determine all points where $y = xe^{-2x}$ has a horizontal tangent.