DERIVATIVE OF $f(x)=e^x$ AND $f(x)=e^{kx}$

1 Write the derivative of:

(a) e^{4x}

(b) $2e^{\frac{x}{2}}$

(c) $e^{4x} - e^{3x}$

(d) $2e^{3x} + e^{-x}$

(e) $4e^{3x} - e^{-2x}$

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2 If $y = e^{x^2}$ then $\dfrac{dy}{dx}$ is: **A** $x^2 e^{x^2}$ **B** $2xe^{x^2}$ **C** $x^2 e^{2x}$ **D** $2xe^{2x}$

3 Differentiate:

(a) $x^2 e^{3x}$ (b) $(2x+1)e^{-x}$ (c) $(x^2+x+1)e^{2x}$ (d) xe^{-2x}

DERIVATIVE OF $f(x)=e^x$ AND $f(x)=e^{kx}$

(i) $\dfrac{e^{3x}}{x}$

(j) $\dfrac{x^3}{e^x}$

(k) $\dfrac{e^{4x}}{x-1}$

(l) $\dfrac{e^x}{\sqrt{x}}$

DERIVATIVE OF $f(x)=e^x$ AND $f(x)=e^{kx}$

4 Differentiate:

(a) e^{2x+3} (b) e^{x^2-2x} (c) $3e^{-x^3}$ (d) $2e^{3x-1}$ (e) $e^{3x-1}+e^{4x+2}$ (f) $\sqrt{x}e^{-x}$ (g) $3e^{2x^2}$ (h) $3e^{2x-1}$ (i) xe^{x^2}

DERIVATIVE OF $f(x)=e^x$ AND $f(x)=e^{kx}$

6 If $x = (1 + t)e^{5t}$, prove that $\dfrac{d^2x}{dt^2} - 10\dfrac{dx}{dt} + 25x = 0$.

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9 Find the equation of the tangent to the curve $y = e^{2x}$ at the point where $x = 1$. Find also the coordinates of the points where the tangent intersects: **(a)** the x-axis   **(b)** the y-axis.

10 Write the equation of the tangent and the normal to the curve $y = 2 + e^{-x}$ at the point where $x = 0$.

11 After n years, the value V of a principal of P dollars that is invested at a rate of $r\%$ per year (with r expressed as a decimal) and compounded continuously is given by $V = Pe^{rn}$. Show that $\dfrac{dV}{dn} = Vr$.

12 The expression $y = 500(1 - e^{-0.2t})$ represents the daily output of y units on day t of a production run. Find the instantaneous rate of change of the output y with respect to t.