Questions Form No. (1)

(Q1) Find the domain of $f(x) = e^{\sqrt{x^2-x-20}}$ (Q2) Evaluate $\lim_{x\to 0} \frac{e^{-x}(e^{2x}-1)^3}{x^3}$

(Q3) Find $\frac{dy}{dx}$ for $y = \ln(4u^2+1)$ and $x = \tan^{-1} 2u$

Questions Form No. (2)

(Q1) Find the domain of $f(x) = e^{\sqrt{x^2+x-20}}$ (Q2) Evaluate $\lim_{x\to 0} \frac{e^{-x}(e^{3x}-1)^2}{x^2}$

(Q3) Find $\frac{dy}{dx}$ for $y = \ln(9u^2+1)$ and $x = \tan^{-1} 3u$

Questions Form No. (3)

(Q1) Find the domain of $f(x) = e^{\sqrt{x^2+2x-15}}$ (Q2) Evaluate $\lim_{x\to 0} \frac{e^{-x}(e^{3x}-1)^3}{x^3}$

(Q3) Find $\frac{dy}{dx}$ for $y = \tan^{-1} 3u$ and $x = \ln(9u^2+1)$

Questions Form No. (4)

(Q1) Find the domain of $f(x) = e^{\sqrt{x^2-2x-15}}$ (Q2) Evaluate $\lim_{x\to 0} \frac{e^{-x}(e^{4x}-1)^2}{x^2}$

(Q3) Find $\frac{dy}{dx}$ for $y = \tan^{-1} 2u$ and $x = \ln(4u^2+1)$

Typical answers No (1)	Typical answers No (2)
(Q1) $x^2 - x - 20 \geq 0$ $(x+4)(x-5) = 0 \Rightarrow x = -4,5$ $(-\infty,-4], [-4,5], [5,\infty)$ $0 \in [-4,5] \Rightarrow -20 > 0$ False $\boxed{D = (-\infty,-4] \cup [5,\infty)}$	(Q1) $x^2 + x - 20 \geq 0$ $(x-4)(x+5) = 0 \Rightarrow x = -5,4$ $(-\infty,-5], [-5,4], [4,\infty)$ $0 \in [-5,4] \Rightarrow -20 > 0$ False $\boxed{D = (-\infty,-5] \cup [4,\infty)}$
(Q2) $= \lim_{x\to 0} e^{-x} \times \lim_{x\to 0} \frac{(e^{2x}-1)^3}{x^3}$ $= 1 \times \left(\lim_{x\to 0} \frac{e^{2x}-1}{x}\right)^3$ $= \left(\lim_{x\to 0} \frac{2e^{2x}}{1}\right)^3 = 8$	(Q2) $= \lim_{x\to 0} e^{-x} \times \lim_{x\to 0} \frac{(e^{3x}-1)^2}{x^2}$ $= 1 \times \left(\lim_{x\to 0} \frac{e^{3x}-1}{x}\right)^2$ $= \left(\lim_{x\to 0} \frac{3e^{3x}}{1}\right)^2 = 9$
(Q3) $\frac{dy}{du} = \frac{8u}{4u^2+1}$ and $\frac{dx}{du} = \frac{2}{1+4u^2}$ $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx} = \frac{8u}{4u^2+1} \times \frac{1+4u^2}{2} = 4u$	(Q3) $\frac{dy}{du} = \frac{18u}{9u^2+1}$ and $\frac{dx}{du} = \frac{3}{1+9u^2}$ $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx} = \frac{18u}{9u^2+1} \times \frac{1+9u^2}{3} = 6u$

Typical answers No (3)	Typical answers No (4)
(Q1) $x^2 + 2x - 15 \geq 0$ $(x+5)(x-3) = 0 \; ⇨ \; x = -5{,}3$ $(-\infty, -5], [-5{,}3], [3, \infty)$ $0 \in [-5{,}3] ⇨ -15 > 0$ False $\boxed{D = (-\infty, -5] \cup [3, \infty)}$	(Q1) $x^2 - 2x - 15 \geq 0$ $(x+3)(x-5) = 0 \; ⇨ x = -3{,}5$ $(-\infty, -3], [-3{,}5], [5, \infty)$ $0 \in [-3{,}5] ⇨ -15 > 0$ False $\boxed{D = (-\infty, 1] \cup [5, \infty)}$
(Q2) $= \lim_{x\to 0} e^{-x} \times \lim_{x\to 0} \frac{(e^{3x}-1)^3}{x^3}$ $= 1 \times \lim_{x\to 0} \frac{(e^{3x}-1)^3}{x^3} = \left(\lim_{x\to 0} \frac{e^{3x}-1}{x}\right)^3$ $= \left(\lim_{x\to 0} \frac{3e^{3x}}{1}\right)^3 = 27$	(Q2) $= \lim_{x\to 0} e^{-x} \times \lim_{x\to 0} \frac{(e^{4x}-1)^2}{x^2}$ $= 1 \times \lim_{x\to 0} \frac{(e^{4x}-1)^2}{x^2} = \left(\lim_{x\to 0} \frac{e^{4x}-1}{x}\right)^2$ $= \left(\lim_{x\to 0} \frac{4e^{4x}}{1}\right)^2 = 16$
(Q3) $\frac{dy}{du} = \frac{3}{1+9u^2}$ and $\frac{dx}{du} = \frac{18u}{9u^2+1}$ $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx} = \frac{3}{1+9u^2} \times \frac{9u^2+1}{18u} = \frac{1}{6u}$	(Q3) $\frac{dy}{du} = \frac{2}{1+4u^2}$ and $\frac{dx}{du} = \frac{8u}{4u^2+1}$ $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx} = \frac{2}{1+4u^2} \times \frac{4u^2+1}{8u} = \frac{1}{4u}$