1. 選擇題【每題 6 分，總計 60%】：

（1）Find the largest domain of the function $f(x) = \sqrt{\dfrac{3-2x}{4+3x}}$. (a)$-\dfrac{3}{2}$ (b)$-\dfrac{2}{3}$ (c)0 (d)2 (e)$\dfrac{2}{3}$ (f)$\dfrac{3}{2}$

（2）The range of the function $f(x) = \sqrt{20+8x-x^2}$ is a closed interval [a, b], please find its length b-a.

(a)1 (b)2 (c)3 (d)4 (e)5 (f)6

（3）Find the value of the $\lim\limits_{x \to 2^-} \dfrac{|x-2|}{x-2}$. (a)1 (b)-2 (c)$\dfrac{1}{2}$ (d)-4 (e)-1 (f)4

（4）Find the value of the $\lim\limits_{x \to \infty} \sqrt{\dfrac{x+8x^2}{2x^2-1}}$. (a)-2 (b)1 (c)2 (d)4 (e)$\dfrac{1}{2}$ (f)0

（5）If $f(x) = \dfrac{x^3}{(x+2)^2}$, find $f'(-1)$. (a)8 (b)5 (c)10 (d)4 (e)20 (f)9

（6）Find the derivative of $f(x) = x^2 \cos x$. (a)$2x\cos x$ (b)$2x\cos x - x^2 \sin x$ (c)$-2x\sin x$

(d) $2x\cos x + x^2 \sin x$ (e)$2x\sin x$ (f)$3x^2 \cos(x^3)$

（7）If $f(x) = \cos^2(2x)$, find $f'(\dfrac{\pi}{3})$. (a)$\sqrt{3}$ (b)$\dfrac{\sqrt{3}}{4}$ (c)1 (d)-1 (e)$-\sqrt{3}$ (f)$-\dfrac{\sqrt{3}}{2}$

（8）Let $y = f(x)$. If $xy^3 + xy = 6$ and $f(3) = 1$, find $f'(3)$. (a)0 (b)1 (c)2 (d)$-\dfrac{1}{6}$ (e)-4 (f)$\dfrac{1}{5}$

（9）How many points of inflection does $f(x) = x^3 e^{-x}$ have? (a)0 (b)1 (c)2 (d)3 (e)4 (f)5

（10）Find the value of the $\int_{-2}^{0} |x+1| dx$. (a)$\dfrac{1}{2}$ (b)$\dfrac{1}{4}$ (c)1 (d)$\dfrac{3}{2}$ (e)$\dfrac{5}{4}$ (f)$\dfrac{5}{2}$

2. 計算題【每題 10 分，總計 40%】：

（1）Find the value of the $\int_{1}^{4} \dfrac{1}{(1+\sqrt{x})^2} \dfrac{1}{\sqrt{x}} dx$

（2）The dye dilution technique is used to measure cardiac output with 6 mg of dye. The dye concentrations, in mg/L, are modeled by $C(t) = \dfrac{1}{15} t(15-t), 0 \le t \le 15$, where t is measured in seconds. Please find the cardiac output.

（3）Let $f(x,y,z) = x^3 y^2 z + 1$. If x=1, please find $(x, x^2, -x)$

（4）Evaluate the iterated integral $\int_{0}^{1} \int_{x}^{3x} \int_{\sqrt{y}}^{x} 2\, zdzdydx$

試題完