**※Single Choice (1~5, 3% each) (每題恰有一解，答對得 3 分，答錯得 0 分)**

1. Find the domain of the function $f(x)=\sqrt{x}$.

Select the correct answer.

(A). $(-\infty,\infty)$ (B). $(-\infty,0)$ (C). $(-\infty,0]$ (D). $(0,\infty)$ (E). $[0,\infty)$

2. Find the range of the function $f(x)=\sqrt{x}$.

Select the correct answer.

(A). $(-\infty,\infty)$ (B). $(-\infty,0)$ (C). $(-\infty,0]$ (D). $(0,\infty)$ (E). $[0,\infty)$

3. If $\lim_{x\to 0}\frac{\sin x}{x}=1$, find the value of $\lim_{x\to 0}\frac{\sin(3x)}{4x}$.

Select the correct answer.

(A). $0$ (B). $\frac{3}{4}$ (C). $\frac{4}{3}$ (D). $1$ (E). none of above

4. $\frac{d}{dx}(\sqrt{x})=?$ Select the correct answer.

(A). $\sqrt{x}$ (B). $\frac{1}{\sqrt{x}}$ (C). $2\sqrt{x}$ (D). $\frac{1}{2\sqrt{x}}$ (E).none of above

5. If $\int_1^5 f(x)dx=2.0$ and $\int_4^5 f(x)dx=3.6$, find the value of $\int_1^4 f(x)dx$.

Select the correct answer.

(A). $5.6$ (B). $-1.6$ (C). $1.6$ (D). $-5.6$ (E).none of above

**※Single Choice (6~15, 5% each) (每題恰有一解，答對得 5 分，答錯得 0 分)**

6. Consider the function $f(x)=\begin{cases}c+\cos x, & x\geq 0\\ \sin x, & x<0\end{cases}$. Find the value of $c$ such that $f(x)$ is continuous on $\Re$ (all real numbers).

Select the correct answer.

(A). $0$ (B). $1$ (C). $-1$ (D). $-2$ (E).none of above

7. If $f(0)=4$, $f'(0)=2$, $g(0)=3$ and $g'(0)=-5$, find the value of $(f\cdot g)'(0)$, where "$\cdot$" stands for multiplication.

Select the correct answer.

(A). $-10$ (B). $-12$ (C). $2$ (D). $-3$ (E). $-14$

8. $\frac{d}{dx}\sin(x^2)=?$.

Select the correct answer.

(A). $\cos(x^2)$ (B). $2\sin x\cos x$ (C). $2x\sin x$ (D). $2x\cos x$ (E). none of above

9. $\frac{d}{dx}\sin^2 x=?$.

Select the correct answer.

(A). $\cos^2 x$ (B). $2\sin x\cos x$ (C). $2x\sin x$ (D). $2x\cos x$ (E). none of above

10. $\int_0^1 xe^{-x}dx = ?$.

Select the correct answer.

(A). $1-\frac{2}{e}$ (B). $1$ (C). $1-\frac{1}{e}$ (D). $e-1$ (E). none of above

11. $\int_0^{\frac{\pi}{2}}\sin^3 x\cdot\cos x\,dx=?$

Select the correct answer.

(A). $\frac{1}{4}$ (B). $\frac{1}{3}$ (C). $\frac{1}{2}$ (D). $1$ (E). none of above

12. $\frac{d}{dx}\int_0^{x^2} t\sin t\,dt = ?$

Select the correct answer.

(A). $x^2\sin(x^2)$ (B). $2x^2\sin(x^2)$ (C). $2x^3\sin(x^2)$ (D). $x^2\cos(x^2)$

(E). none of above

13. Find the absolute maximum value of the function $f(x)=x^3-12x+3$ on the interval [0, 3].

Select the correct answer.

(A). $0$ (B). $1$ (C). $3$ (D). $6$ (E). none of above

14. Find the length of the curve $y=\frac{1}{6}(x^2+4)^{\frac{3}{2}}$ , $0\le x\le 3$ ,

Select the correct answer.

(A). $1$ (B). $\frac{1}{2}$ (C). $2$ (D). $\frac{15}{2}$ (E). none of above

15. Find the area bounded by the curves $f(x)=x^2$ and $g(x)=x$.

Select the correct answer.

(A). $1$ (B). $\frac{1}{2}$ (C). $\frac{1}{3}$ (D). $\frac{1}{6}$ (E). none of above

**※Multiple Choice (16~20, 7% each) (每題至少有二正確解，完全答對得 7 分，對 4 錯 1 得 4 分，對 3 錯 2 得 1 分，其餘情形得 0 分)**

16. Which of the following functions are differentiable on $(-\infty,\infty)$?

(A). $x$ (B). $|x|$ (C). $x^3$ (D). $|x^3|$ (E). $e^x$

17. Consider the function $f(x)=e^{-x^2}$. Which of the following statements about $f(x)$ are true?

(A). $\lim_{x\to-\infty} f(x)=\infty$

(B). $f(x)$ is continuous on $(-\infty,\infty)$

(C). $f(x)$ is differentiable on $(-\infty,\infty)$

(D). $f'(x)=2xe^{-x^2}$

(E). $\int_{-\infty}^{\infty} f(x)\,dx = 1$

18. Which of the following equalities are true?

(A). $\frac{d}{dx}(f(x)+g(x)) = \frac{d}{dx}f(x) + \frac{d}{dx}g(x)$

(B). $\frac{d}{dx}(f(x)\cdot g(x)) = \frac{d}{dx}f(x)\cdot\frac{d}{dx}g(x)$

(C). $\int_a^b f(x)+g(x)\,dx = \int_a^b f(x)\,dx + \int_a^b g(x)\,dx$

(D). $\int_a^b f(x)\cdot g(x)\,dx = \int_a^b f(x)\,dx \cdot \int_a^b g(x)\,dx$

(E). $\int_a^b \frac{f(x)}{g(x)}\,dx = \frac{\int_a^b f(x)\,dx}{\int_a^b g(x)\,dx}$

19. A function $f(x)$ is said to be increasing if $f(x_2) \geq f(x_1)$ for every $x_2 \geq x_1$.

Which of the following functions are increasing?

(A). $x^2$ (B). $x^3$ (C). $\sin x$ (D). $e^x$ (E). $xe^x$

20. $f(x,y) = x^3 - 12xy + 3y^2$, Select the correct answers.

(A). $f_x = 3x^2 - 12y$ (B). $f_y = -12x - 6y$ (C). $f_{xy} = -12$

(D). $f_{yy} = 12$ (E). $f_{xx} = 6x$