AP Calculus AB
Practice Exam I

Name: ____________________

Block: __________ Date: __________

A GRAPHING CALCULATOR IS NOT ALLOWED FOR THIS SECTION OF THE EXAM.

Part I: Multiple Choice. Determine which of the given choices is the best choice. Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

1. If $f(x) = 5x^{4/3}$, then $f'(8) =$

   A. 10 B. $\frac{40}{3}$ C. 40 D. 80 E. $\frac{160}{3}$

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2. $\lim_{x\to\infty} \frac{5x^2 - 3x + 1}{4x^2 + 2x + 5}$ is

   A. 0 B. $\frac{4}{5}$ C. $\frac{3}{11}$ D. $\frac{5}{4}$ E. ∞

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3. If $f(x) = \frac{3x^2 + x}{3x^2 - x}$, then $f'(x)$ is

   A. 1 B. $\frac{6x^2+1}{6x^2-1}$ C. $\frac{-6}{(3x-1)^2}$ D. $\frac{-2x^2}{(x^2-x)^2}$ E. $\frac{36x^3-2x}{(x^2-x)^2}$

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4. If the function f is continuous for all real numbers and if $f(x) = \frac{x^2 - 7x + 12}{x - 4}$ when $x \neq 4$, then $f(4) =$

   A. 1 B. $\frac{8}{7}$ C. -1 D. 0 E. undefined

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5. If $x^2 - 2xy + 3y^2 = 8$, then $\frac{dy}{dx} =$

   A. $\frac{8+2y-2x}{6y-2x}$ B. $\frac{3y-x}{y-x}$ C. $\frac{2x-2y}{6y-2x}$ D. $\frac{1}{3}$ E. $\frac{y-x}{3y-x}$

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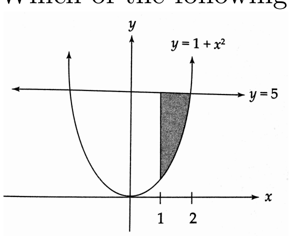
6. Which of the following integrals correctly corresponds to the area of the shaded region in the figure below?



A. $\int_1^2 (x^2-4)\,dx$ B. $\int_1^2 (4-x^2)\,dx$ C. $\int_1^5 (x^2-4)\,dx$ D. $\int_1^2 (x^2+4)\,dx$ E. $\int_1^5 (4-x^2)\,dx$

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7. If $f(x) = \sec x + \csc x$, then $f'(x) =$

A. 0 B. $\sec^2 x + \csc^2 x$ C. $\csc x - \sec x$ D. $\sec x \tan x + \csc x \cot x$ E. $\sec x \tan x - \csc x \cot x$

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8. An equation of the line normal to the graph of $y = \sqrt{(3x^2+2x)}$ at $(2,4)$ is

A. $-4x + y = 20$ B. $4x + 7y = 20$ C. $-7x + 4y = 2$ D. $7x + 4y = 30$ E. $4x + 7y = 36$

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9. $\displaystyle\int_{-1}^{1} \frac{4}{1+x^2}\,dx$

A. 0 B. π C. 1 D. 2π E. 2

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10. If $f(x) = \cos^2 x$, then $f''(\pi) =$

A. -2 B. 0 C. 1 D. 2 E. 2π

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11. If $f(x) = \dfrac{5}{x^2+1}$ and $g(x) = 3x$, then $g(f(2)) =$

A. -3 B. $\dfrac{5}{37}$ C. 3 D. 5 E. $\dfrac{37}{5}$

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12. $\int x\sqrt{5x^2-4}\,dx =$

A. $\dfrac{1}{10}(5x^2-4)^{3/2} + C$ B. $\dfrac{1}{15}(5x^2-4)^{3/2} + C$ C. $-\dfrac{1}{5}(5x^2-4)^{-1/2} + C$

D. $\dfrac{20}{3}(5x^2-4)^{3/2} + C$ E. $\dfrac{3}{20}(5x^2-4)^{3/2} + C$

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13. The slope of the line tangent to the graph of $3x^2 + 5\ln y = 12$ at $(2,1)$ is

A. $-\dfrac{12}{5}$ B. $\dfrac{12}{5}$ C. $\dfrac{5}{12}$ D. 12 E. -7

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14. The equation $y = 2 - 3\sin\frac{\pi}{4}(x-1)$ has a fundamental period of

A. $\dfrac{1}{8}$ B. $\dfrac{\pi}{4}$ C. $\dfrac{4}{\pi}$ D. 8 E. 2π

15. If $f(x) = \begin{cases} x^2+5, & x<2 \\ 7x-5, & x \geq 2 \end{cases}$, for all real numbers x, which of the following must be true?

I. $f(x)$ is continuous everywhere

II. $f(x)$ is differentiable everywhere

III. $f(x)$ has a local minimum at $x = 2$

A. I only B. I and II only C. II and III only D. I and III only E. I, II, and III

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16. For what value of x does the function $f(x) = x^3 - 9x^2 - 120x + 6$ have a local minimum?

A. 10 B. 4 C. 3 D. -4 E. -10

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17. The acceleration of a particle moving along the x-axis at time t is given by $a(t) = 4t - 12$. If the velocity is 10 when $t = 0$ and the position is 4 when $t = 0$, then the particle is changing direction at

A. $t = 1$ B. $t = 3$ C. $t = 5$ D. $t = 1$ and $t = 5$ E. $t = 1, t = 3$, and $t = 5$

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18. The average value of the function $f(x) = (x-1)^2$ on the interval from $x = 1$ to $x = 5$ is

A. $-\frac{16}{3}$ B. $\frac{16}{3}$ C. $\frac{64}{3}$ D. $\frac{66}{3}$ E. $\frac{256}{3}$

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19. $\int (e^{3\ln x} + e^{3x})\,dx =$

A. $3 + \frac{e^{3x}}{3} + C$ B. $\frac{x^4}{4} + 3e^{3x} + C$ C. $\frac{e^{x^4}}{4} + 3e^{3x} + C$ D. $\frac{e^{x^4}}{4} + \frac{e^{3x}}{3} + C$ E. $\frac{x^4}{4} + \frac{e^{3x}}{3} + C$

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20. If $f(x) = (x^2 + x + 11)\sqrt{(x^3 + 5x + 121)}$, then $f'(0) =$

A. $\frac{5}{2}$ B. $\frac{27}{2}$ C. 22 D. $22 + \frac{2}{\sqrt{5}}$ E. $\frac{247}{2}$

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21. If $f(x) = 5^{3x}$, then $f'(x) =$

A. $5^{3x}(\ln 125)$ B. $\frac{5^{3x}}{3\ln 5}$ C. $3(5^{2x})$ D. $3(5^{3x})$ E. $3x(5^{3x-1})$

22. A solid is generated when the region in the first quadrant enclosed by the graph of $y = (x^2+1)^3$, the line $x = 1$, the x-axis, and the y-axis is revolved about the x-axis. Its volume is found by evaluating which of the following integrals?

A. $\pi \int_1^8 (x^2+1)^3\,dx$ B. $\pi \int_1^8 (x^2+1)^6\,dx$ C. $\pi \int_0^1 (x^2+1)^3\,dx$

D. $\pi \int_0^1 (x^2+1)^6\,dx$ E. $2\pi \int_0^1 (x^2+1)^6\,dx$

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23. $\lim_{x\to 0} 4\left(\frac{\sin x \cos x - \sin x}{x^2}\right) =$

A. 2 B. $\frac{40}{3}$ C. ∞ D. 0 E. undefined

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24. If $\frac{dy}{dx} = \frac{(3x^2+2)}{y}$ and $y = 4$ when $x = 2$, then when $x = 3$, $y =$

A. 18 B. $\pm\sqrt{66}$ C. 58 D. $\pm\sqrt{74}$ E. $\pm\sqrt{58}$

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25. $\int \frac{dx}{9+x^2}$

A. $3\tan^{-1}(\frac{x}{3}) + C$ B. $\frac{1}{3}\tan^{-1}(\frac{x}{3}) + C$ C. $\frac{1}{9}\tan^{-1}(\frac{x}{3}) + C$ D. $\frac{1}{3}\tan^{-1} x + C$ E. $\frac{1}{9}\tan^{-1} x + C$

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26. If $f(x) = \cos^3(x+1)$, then $f'(\pi) =$

A. $-3\cos^2(\pi+1)\sin(\pi+1)$ B. $3\cos^2(\pi+1)$ C. $3\cos^2(\pi+1)\sin(\pi+1)$ D. $3\pi\cos^2(\pi+1)$ E. 0

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27. $\int x\sqrt{x+3}\,dx =$

A. $\frac{2}{3}x^{3/2} + 6x^{1/2} + C$ B. $\frac{2(x+3)^{3/2}}{3} + C$ C. $\frac{2}{5}(x+3)^{5/2} - 2(x+3)^{3/2} + C$

D. $\frac{3(x+3)^{3/2}}{2} + C$ E. $\frac{4x^2(x+3)^{3/2}}{3} + C$

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28. If $f(x) = \ln(\ln(1-x))$, then $f'(x) =$

A. $-\frac{1}{\ln(1-x)}$ B. $\frac{1}{(1-x)\ln(1-x)}$ C. $\frac{1}{(1-x)^2}$ D. $-\frac{1}{(1-x)\ln(1-x)}$ E. $-\frac{1}{\ln(1-x)^2}$