

Do not use a calculator on this portion.

1. $\int_1^2 (4x^3 - 6x) dx =$

- (A) 2 (B) 4 (C) 6 (D) 36 (E) 42

2. If $f(x) = x\sqrt{2x-3}$, then $f'(x) =$

(A) $\frac{3x-3}{\sqrt{2x-3}}$ (B) $\frac{x}{\sqrt{2x-3}}$ (C) $\frac{1}{\sqrt{2x-3}}$

(D) $\frac{-x+3}{\sqrt{2x-3}}$ (E) $\frac{5x-6}{\sqrt{2x-3}}$

5. The graph of $y = 3x^4 - 16x^3 + 24x^2 + 48$ is concave down for

(A) $x < 0$ (B) $x > 0$ (C) $x < -2$ or $x > -\frac{2}{3}$

(D) $x < \frac{2}{3}$ or $x > 2$ (E) $\frac{2}{3} < x < 2$

6. $\frac{1}{2} \int e^{\frac{t}{2}} dt =$

(A) $e^{-t} + C$ (B) $e^{\frac{-t}{2}} + C$ (C) $e^{\frac{t}{2}} + C$

(D) $2e^{\frac{t}{2}} + C$ (E) $e^t + C$

7. $\frac{d}{dx} \cos^2(x^3) =$

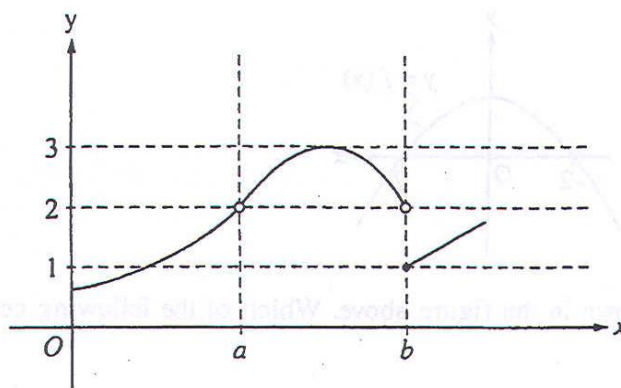
(A) $6x^2 \sin(x^3) \cos(x^3)$ (B) $6x^2 \cos(x^3)$ (C) $\sin^2(x^3)$

(D) $-6x^2 \sin(x^3) \cos(x^3)$ (E) $-2 \sin(x^3) \cos(x^3)$

10. An equation of the line tangent to the graph of $y = \cos(2x)$ at $x = \frac{\pi}{4}$ is
- (A) $y - 1 = -\left(x - \frac{\pi}{4}\right)$ (B) $y - 1 = -2\left(x - \frac{\pi}{4}\right)$ (C) $y = 2\left(x - \frac{\pi}{4}\right)$
- (D) $y = -\left(x - \frac{\pi}{4}\right)$ (E) $y = -2\left(x - \frac{\pi}{4}\right)$.
12. At what point on the graph of $y = \frac{1}{2}x^2$ is the tangent line parallel to the line $2x - 4y = 3$?
- (A) $\left(\frac{1}{2}, -\frac{1}{2}\right)$ (B) $\left(\frac{1}{2}, \frac{1}{8}\right)$ (C) $\left(1, -\frac{1}{4}\right)$ (D) $\left(1, \frac{1}{2}\right)$ (E) $(2, 2)$

15. The graph of the function f in shown in the figure. Which of the following statements about f is true?

- (A) $\lim_{x \rightarrow a} f(x) = \lim_{x \rightarrow b} f(x)$
- (B) $\lim_{x \rightarrow a} f(x) = 2$
- (C) $\lim_{x \rightarrow b} f(x) = 2$
- (D) $\lim_{x \rightarrow b} f(x) = 1$
- (E) $\lim_{x \rightarrow a} f(x)$ does not exist



17. If $x^2 + y^2 = 25$, what is the value of $\frac{d^2y}{dx^2}$ at the point $(4, 3)$?
- (A) $-\frac{25}{27}$ (B) $-\frac{7}{27}$ (C) $\frac{7}{27}$ (D) $\frac{3}{4}$ (E) $\frac{25}{27}$
19. If $f(x) = \ln|x^2 - 1|$, then $f'(x) =$
- (A) $\left|\frac{2x}{x^2 - 1}\right|$ (B) $\frac{2x}{|x^2 - 1|}$ (C) $\frac{2|x|}{x^2 - 1}$
- (D) $\frac{2x}{x^2 - 1}$ (E) $\frac{1}{x^2 - 1}$

You may use a calculator on the remaining problems. It will not be needed on all problems.

76. If $f(x) = \frac{e^{2x}}{2x}$, then $f'(x) =$
- (A) 1 (B) $\frac{e^{2x}(1-2x)}{2x^2}$ (C) e^{2x}
(D) $\frac{e^{2x}(2x+1)}{x^2}$ (E) $\frac{e^{2x}(2x-1)}{2x^2}$
79. Let f be a function such that $\lim_{h \rightarrow 0} \frac{f(2+h) - f(2)}{h} = 5$. Which of the following must be true?
- I. f is continuous at $x = 2$.
II. f is differentiable at $x = 2$.
- (A) I only (B) II only (C) I and II
80. Let f be the function given by $f(x) = 2e^{4x^2}$. For what value of x is the slope of the line tangent to the graph of f at $(x, f(x))$ equal to 3?
- (A) 0.168 (B) 0.276 (C) 0.318 (D) 0.342 (E) 0.551
85. If the derivative of f is given by $f'(x) = e^x - 3x^2$, at which of the following x does f have a relative maximum value?
- (A) -0.46 (B) 0.20 (C) 0.91 (D) 0.95 (E) 3.73
82. If $y = 2x - 8$, what is the minimum value of the product xy ?
- (A) -16 (B) -8 (C) -4 (D) 0 (E) 2
83. What is the area of the region in the first quadrant enclosed by the graphs of $y = \cos x$, $y = x$, and the y -axis?
- (A) 0.127 (B) 0.385 (C) 0.400 (D) 0.600 (E) 0.947