## Review 10, No Calculator

Complete all the following on notebook paper.

1.

A particle moves in a straight line with velocity  $v(t) = t^2$ . How far does the particle move between times t = 1 and t = 2?

- (A)  $\frac{1}{3}$  (B)  $\frac{7}{3}$  (C) 3 (D) 7
- (E) 8

\_\_\_\_2.

If  $y = \cos^2 3x$ , then  $\frac{dy}{dx} =$ 

(A)  $-6\sin 3x \cos 3x$ 

 $-2\cos 3x$ (B)

(C)  $2\cos 3x$ 

(D)  $6\cos 3x$ 

 $2\sin 3x\cos 3x$ (E)

\_\_\_\_3.

The *derivative* of  $f(x) = \frac{x^4}{3} - \frac{x^5}{5}$  attains its maximum value at  $x = \frac{x^4}{5} - \frac{x^5}{5}$ 

- (A) -1
- (B) 0
- (C) 1
- (D)  $\frac{4}{3}$
- (E)  $\frac{3}{3}$

If the line 3x-4y=0 is tangent in the first quadrant to the curve  $y=x^3+k$ , then k is

- (A)  $\frac{1}{2}$  (B)  $\frac{1}{4}$
- (C) 0 (D)  $-\frac{1}{8}$  (E)  $-\frac{1}{2}$

If  $f(x) = 2x^3 + Ax^2 + Bx - 5$  and if f(2) = 3 and f(-2) = -37, what is the value of A + B?

- (A) -6
- (B) -3
- (C) -1
- (D) 2
- (E) It cannot be determined from the information given.

|  | 6 |
|--|---|
|  |   |
|  |   |
|  |   |
|  |   |
|  |   |
|  |   |
|  |   |
|  |   |
|  |   |

The acceleration  $\alpha$  of a body moving in a straight line is given in terms of time t by  $\alpha = 8 - 6t$ . If the velocity of the body is 25 at t = 1 and if s(t) is the distance of the body from the origin at time t, what is s(4) - s(2)?

- (A) 20
- (B) 24
- (C) 28
- (D) 32
- (E) 42

If  $f(x) = x^{\frac{1}{3}} (x-2)^{\frac{2}{3}}$  for all x, then the domain of f' is

(A)  $\{x \mid x \neq 0\}$ 

(B)  $\{x \mid x > 0\}$ 

- (C)  $\{x \mid 0 \le x \le 2\}$
- (D)  $\{x \mid x \neq 0 \text{ and } x \neq 2\}$  (E)  $\{x \mid x \text{ is a real number}\}$

8.

The area of the region bounded by the lines x = 0, x = 2, and y = 0 and the curve  $y = e^{\overline{2}}$  is

- (A)  $\frac{e-1}{2}$  (B) e-1 (C) 2(e-1) (D) 2e-1
- (E) 2e

9.

The number of bacteria in a culture is growing at a rate of  $3000e^{\frac{2t}{5}}$  per unit of time t. At t = 0, the number of bacteria present was 7,500. Find the number present at t = 5.

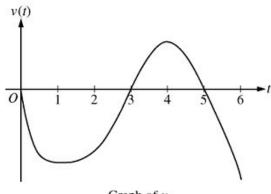
- (A)  $1.200e^2$

- (B)  $3,000e^2$  (C)  $7,500e^2$  (D)  $7,500e^5$  (E)  $\frac{15,000}{7}e^7$

10.

What is the area of the region completely bounded by the curve  $y = -x^2 + x + 6$  and the line v = 4?

- (A)  $\frac{3}{2}$  (B)  $\frac{7}{3}$  (C)  $\frac{9}{2}$  (D)  $\frac{31}{6}$  (E)  $\frac{33}{2}$



Graph of v

A particle moves along the x-axis so that its velocity at time t, for  $0 \le t \le 6$ , is given by a differentiable function v whose graph is shown above. The velocity is 0 at t = 0, t = 3, and t = 5, and the graph has horizontal tangents at t = 1 and t = 4. The areas of the regions bounded by the t-axis and the graph of v on the intervals [0, 3], [3, 5], and [5, 6] are [5, 6] are

- (a) For  $0 \le t \le 6$ , find both the time and the position of the particle when the particle is farthest to the left. Justify your answer.
- (b) For how many values of t, where  $0 \le t \le 6$ , is the particle at x = -8? Explain your reasoning.
- (c) On the interval 2 < t < 3, is the speed of the particle increasing or decreasing? Give a reason for your answer.</p>
- (d) During what time intervals, if any, is the acceleration of the particle negative? Justify your answer.

## 12. 2008-AB5

Consider the differential equation  $\frac{dy}{dx} = \frac{y-1}{x^2}$ , where  $x \neq 0$ .

(a) On the axes provided, sketch a slope field for the given differential equation at the nine points indicated.

(Note: Use the axes provided in the exam booklet.)

