

## 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)  $-6\sin 3x \cos 3x$       (B)  $-2\cos 3x$       (C)  $2\cos 3x$   
(D)  $6\cos 3x$       (E)  $2\sin 3x \cos 3x$

\_\_\_\_\_ 3.

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

- (A)  $-1$       (B) 0      (C) 1      (D)  $\frac{4}{3}$       (E)  $\frac{5}{3}$

\_\_\_\_\_ 4.

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)  $-\frac{1}{2}$

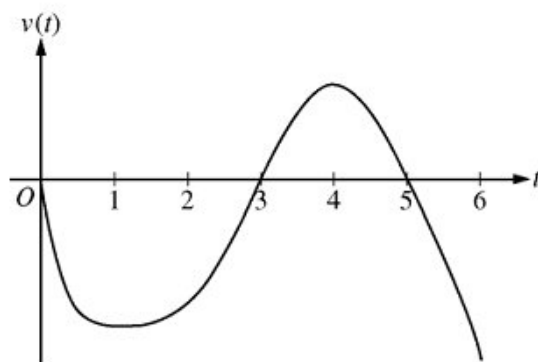
\_\_\_\_\_ 5.

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.



## 11. 2008-AB4

Graph of  $v$ 

A particle moves along the  $x$ -axis so that its velocity at time  $t$ , for  $0 \leq t \leq 6$ , 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 8, 3, and 2, respectively. At time  $t = 0$ , the particle is at  $x = -2$ .

- For  $0 \leq t \leq 6$ , find both the time and the position of the particle when the particle is farthest to the left. Justify your answer.
- For how many values of  $t$ , where  $0 \leq t \leq 6$ , is the particle at  $x = -8$ ? Explain your reasoning.
- On the interval  $2 < t < 3$ , is the speed of the particle increasing or decreasing? Give a reason for your answer.
- 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  $x \neq 0$ .

- 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.)**
- Find the particular solution  $y = f(x)$  to the differential equation with the initial condition  $f(2) = 0$ .
- For the particular solution  $y = f(x)$  described in part (b), find  $\lim_{x \rightarrow \infty} f(x)$ .

