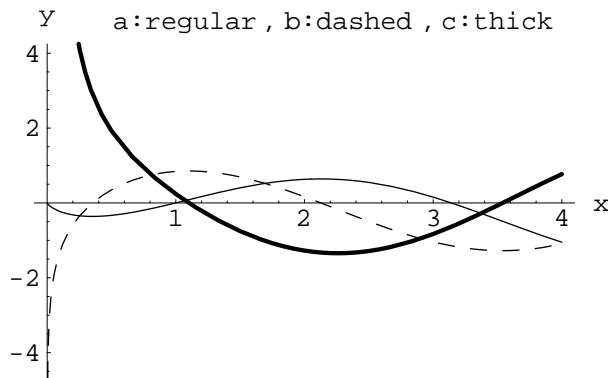


1. If  $f(x) = (e^{2x} + 1)^8$ , then  $f'(1) =$   
 1)  $8(e^2 + 1)^7$     2)  $16(e^2 + 1)^7$     3)  $8e^2(e^2 + 1)^7$     4)  $16e^2(e^2 + 1)^7$

2. Which of the following functions has a removable discontinuity at  $x = 0$ ?

- 1)  $x \sin\left(\frac{1}{x}\right)$     2)  $\ln(x)$     3)  $\sqrt{x-1}$     4)  $\frac{x-1}{x^2-1}$

3. The following picture shows the graphs of  $f$ ,  $f'$ , and  $f''$ . Identify each curve.



- $f = a$      $f = c$      $f = a$      $f = b$   
 1)  $f' = b$     2)  $f' = b$     3)  $f' = c$     4)  $f' = c$   
 $f'' = c$      $f'' = a$      $f'' = b$      $f'' = a$

4. Consider the function  $f(x) = x^3 - 6x$  on the interval  $[-2, 2]$ . Which of the following statements is true?

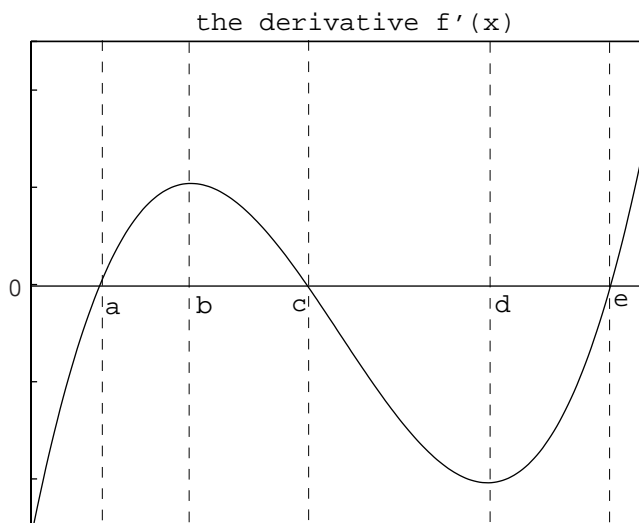
- 1) The absolute maximum value of  $f$  is 4.  
 2) The absolute maximum value of  $f$  is  $4\sqrt{2}$ .  
 3) The absolute maximum value of  $f$  is 5.  
 4) There is no absolute maximum value of  $f$  on the interval.

5. Suppose  $z = x^3y^2$  where both  $x$  and  $y$  are changing with time. At a certain instant when  $x = 1$  and  $y = 2$ ,  $x$  is decreasing at the rate of 2 units/sec and  $y$  is increasing at the rate of 3 units/sec. How fast is  $z$  changing at this instant and is it increasing or decreasing?

- 1)  $z$  is increasing at the rate of 24 units/sec.  
 2)  $z$  is decreasing at the rate of 24 units/sec.  
 3)  $z$  is increasing at the rate of 12 units/sec.  
 4)  $z$  is decreasing at the rate of 12 units/sec.

6. The figure below gives the graph of the derivative  $f'(x)$  for a function  $y = f(x)$ . Which of the following is true about the function  $f(x)$ .

- 1)  $f$  is increasing on the interval  $(c, d)$ .
- 2)  $f$  is concave down on  $(a, b)$ .
- 3)  $f$  has a local maximum at  $c$ .
- 4)  $f$  has a local minimum at  $c$ .



7. Below is given a table of values for  $f(2+h)$  and  $\frac{f(2+h) - f(2)}{h}$  for  $h$  ranging from .1 to .00001.

$h$	$f(2+h)$	$\frac{f(2+h) - f(2)}{h}$
.1	-1.001	-2.444
.01	-0.786	-2.950
.001	-0.760	-2.989
.0001	-0.757	-2.993
.00001	-0.757	-2.993

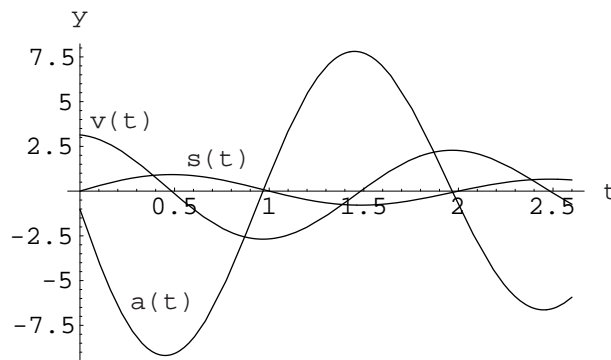
Which of the following statements is best supported by the data?

- 1)  $f(2) \approx -3$
- 2)  $f'(2) \approx -3$
- 3)  $\lim_{h \rightarrow 0} f(h) \approx -0.76$
- 4)  $\lim_{x \rightarrow 0} f'(x) \approx -3$

8. What is the average rate of change for the function  $g(x) = x^2$  on the interval  $[1, 3]$ ?

- 1) 8
- 2) 2
- 3) 6
- 4) 4

9. The position of a particle moving along a horizontal coordinate line (in which the positive direction is rightward) is given by the formula  $s(t) = (.85)^t \sin(\pi t)$  where  $t$  is in seconds. Below is the graph of the position, velocity, and acceleration functions. Which of the following is correct?



- 1) The particle is moving to the right approximately over  $(0, .5)$  and  $(1.5, 2.5)$  and is slowing down approximately over  $(0, .5)$ ,  $(1, 1.5)$ , and  $(2, 2.5)$ .
- 2) The particle is moving to the right approximately over  $(0, .5)$  and  $(1.5, 2.5)$  and is slowing down approximately over  $(.5, 1)$ ,  $(1.5, 2)$ , and  $(2.5, 2.6)$ .
- 3) The particle is moving to the right approximately over  $(.5, 1.5)$  and  $(2.5, 2.6)$  and is slowing down approximately over  $(0, .5)$ ,  $(1, 1.5)$ , and  $(2, 2.5)$ .
- 4) The particle is moving to the right approximately over  $(.5, 1.5)$  and  $(2.5, 2.6)$  and is slowing down approximately over  $(0, .5)$ ,  $(1.5, 2)$ , and  $(2.5, 2.6)$ .

10. A  $600 \text{ m}^2$  rectangular pea patch is to be enclosed by a fence and divided into two equal parts by another fence parallel to one of the sides. The smallest total length of fence required is

- 1) 100 m    2)  $45\sqrt{6}$  m    3) 120 m    4)  $50\sqrt{6}$  m

11. If  $f(x) = \ln(\cos x)$ ,  $f''(x) =$

- 1)  $\cot x$     2)  $-\sec^2 x$     3)  $\sec x \tan x$     4)  $-1$

12. Use differentials or a linearization to approximate  $\sqrt{4.1}$ .  $\sqrt{4.1} \approx$

- 1) 2.05    2) 2.025    3) 2.024    4) 2.02

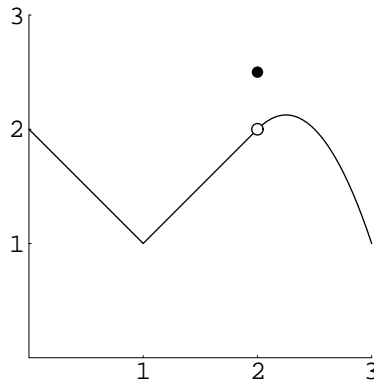
13. The 2<sup>nd</sup> degree Taylor polynomial  $P_2(x)$  of  $f(x) = \sin(x) + \sin(2x)$  centered at  $a = \pi/2$  is

- 1)  $1 - (x - \frac{\pi}{2}) - (x - \frac{\pi}{2})^2$       2)  $1 - (x - \frac{\pi}{2}) - \frac{1}{2}(x - \frac{\pi}{2})^2$   
 3)  $1 - 2(x - \frac{\pi}{2}) - (x - \frac{\pi}{2})^2$       4)  $1 - 2(x - \frac{\pi}{2}) - \frac{1}{2}(x - \frac{\pi}{2})^2$

14.  $\lim_{q \rightarrow \infty} \frac{3q^2 - q + 2}{q^2 + 7q + 1} =$

- 1) 3      2) 3/2      3) 4/9      4) 5/3

15. A function  $f(x)$  is graphed below on the interval  $[0, 3]$ .



The function  $f(x)$

For what values (if any) of  $a$  in  $(0, 3)$  does  $\lim_{x \rightarrow a} f(x)$  fail to exist?

- 1) The limit exists at each point in  $(0, 3)$ .  
 2) The limit fails to exist only at  $x = 1$ .  
 3) The limit fails to exist only at  $x = 2$ .  
 4) The limit fails to exist only at  $x = 1$  and at  $x = 2$ .