TEST 3 PROBLEMS

1. What is the derivative of $\dfrac{1}{\sqrt{x}}$?

(a) $-\dfrac{1}{2}x^{-3/2}$

(b) $\dfrac{1}{2}x^{1/2}$

(c) $2\sqrt{x}$

(d) $-2x^{-1/2}$

1. What is the derivative of $\dfrac{1}{\sqrt{x}}$?

(a) $-\dfrac{1}{2}x^{-3/2}$ ✓

(b) $\dfrac{1}{2}x^{1/2}$

(c) $2\sqrt{x}$

(d) $-2x^{-1/2}$

2. What is the derivative of xe^{-x} ?

(a) $e^{-x} + xe^{-x}$

(b) $xe^{-x} + e^{-x-1}$

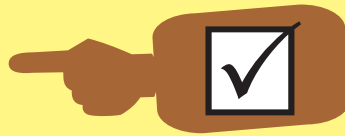(c) $e^{-x} - xe^{-x-1}$

(d) $e^{-x} - xe^{-x}$

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(b) $xe^{-x} + e^{-x-1}$

(c) $e^{-x} - xe^{-x-1}$

(d) $e^{-x} - xe^{-x}$ ✓

3. What is the derivative of $\ln(x^3 - 3x)$?

(a) $\dfrac{1}{x^3 - 3x}$

(b) $\dfrac{1}{(x^3 - 3x)^2}$

(c) $\dfrac{3x^2 - 3}{x^3 - 3x}$

(d) $\dfrac{3x^2 - 3}{(x^3 - 3x)^2}$

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(d) $\dfrac{3x^2 - 3}{(x^3 - 3x)^2}$

4. What is the derivative of $\dfrac{x}{2x-1}$?

(a) $\dfrac{1}{(2x-1)^2}$

(b) $\dfrac{-1}{(2x-1)^2}$

(c) $\dfrac{1}{2}$

(d) $\dfrac{1}{4}$

4. What is the derivative of $\dfrac{x}{2x-1}$?

(a) $\dfrac{1}{(2x-1)^2}$

(b) $\dfrac{-1}{(2x-1)^2}$ ✓

(c) $\dfrac{1}{2}$

(d) $\dfrac{1}{4}$

5. How many critical points are in the graph pictured in Figure 1?

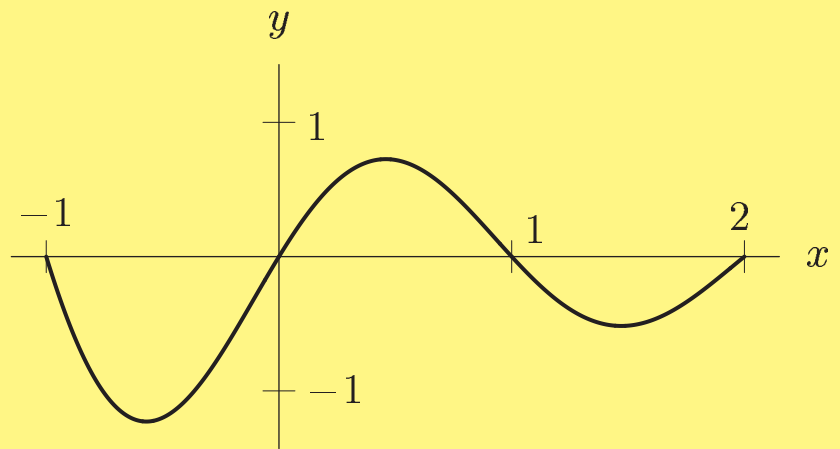(a) **1**

(b) **2**

(c) **3**

(d) **4**

Figure 1

5. How many critical points are in the graph pictured in Figure 1?

(a) 1

(b) 2

(c) 3 ✓

(d) 4

Figure 1

6. Which of the following approximates a local minimum *value* for the function graphed in Figure 2?

(a) -6

(b) 2

(c) 4

(d) 60

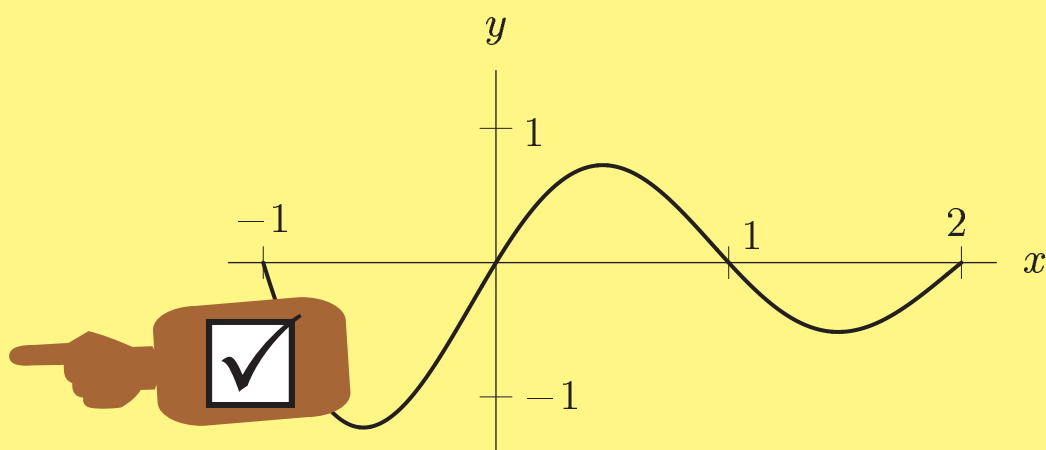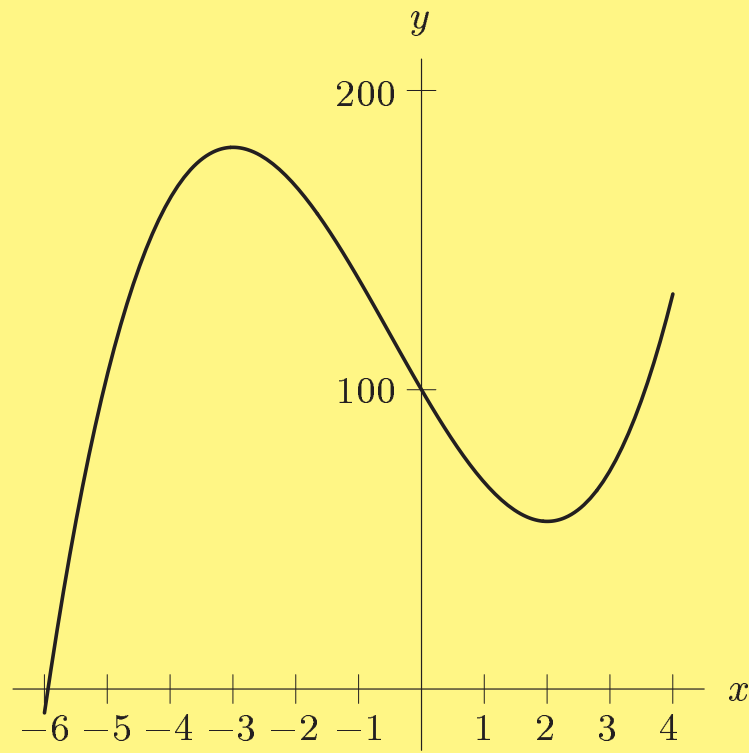**Figure 2**

6. Which of the following approximates a local minimum *value* for the function graphed in Figure 2?

(a) -6

(b) 2

(c) 4

(d) 60 ✓
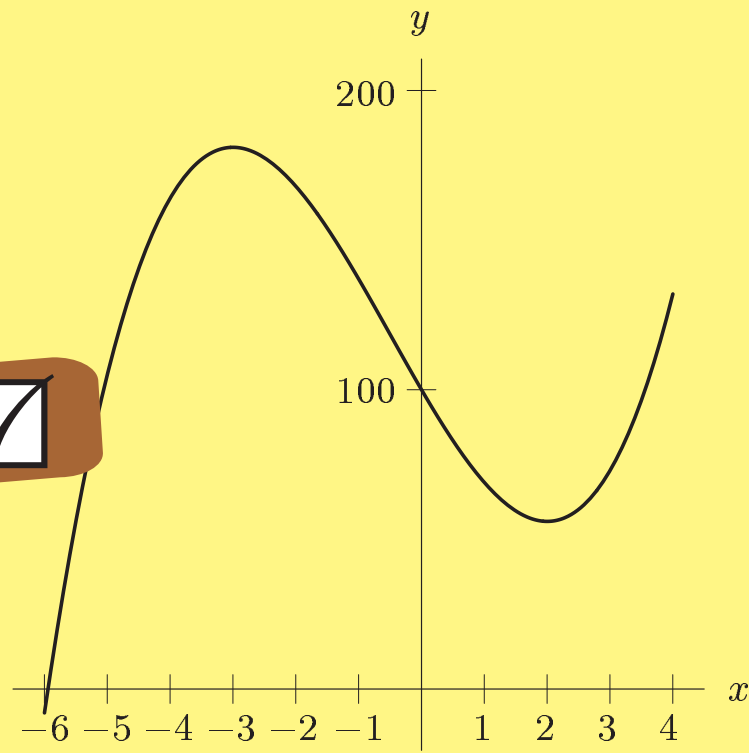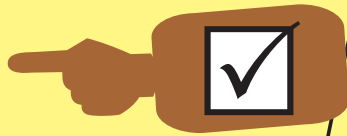
Figure 2

7. Suppose that
$$g(x) = (4x^3 - 6x^2 + 6x - 3)e^{2x}$$
and
$$g'(x) = 8x^3 e^{2x}.$$

You do not need to justify that the derivative of $g(x)$ above is what I have written for $g'(x)$. What is the derivative of $g(x)^3$?

(a) $24x^3(4x^3 - 6x^2 + 6x - 3)^2 e^{2x}$

(b) $24x^3(4x^3 - 6x^2 + 6x - 3)^2 e^{4x}$

(c) $24x^3(4x^3 - 6x^2 + 6x - 3)^2 e^{6x}$

(d) $24x^3(4x^3 - 6x^2 + 6x - 3)^2 e^{8x}$

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(c) $24x^3(4x^3 - 6x^2 + 6x - 3)^2 e^{6x}$ ✓

(d) $24x^3(4x^3 - 6x^2 + 6x - 3)^2 e^{8x}$
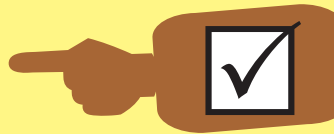
8. The population in Mexico in millions is approximated by the formula $P(t) = 70e^{0.03t}$, where t is the number of years after 1980. In the year 2000, approximately how fast will the population of Mexico be increasing?

    (a) $70e^{0.6}$ million people per year

    (b) $27e^{0.6}$ million people per year

    (c) $6e^{0.6}$ million people per year

    (d) $2.1e^{0.6}$ million people per year

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9. The slope of the tangent line to the graph of

$$y = 2(ax - 1)^5$$

at $x = 0$ is 4. What is the value of a?

(a) $2/5$

(b) $1/5$

(c) $-1/10$

(d) $-1/5$

9. The slope of the tangent line to the graph of
$$y = 2(ax - 1)^5$$
at $x = 0$ is 4. What is the value of a?

(a) $2/5$

(b) $1/5$

(c) $-1/10$

(d) $-1/5$

10. The cost of producing a quantity, q, of a product is given by

$$C(q) = 1000 + 30e^{0.02q}$$

dollars. Which of following is an estimate for the marginal cost (in dollars per item) when $q = 20$? The choices are based on one or more of the estimates given in the table to the right.

Approximate Values
$e^{0.01} \approx 1.01$
$e^{0.02} \approx 1.02$
$e^{0.04} \approx 1.04$
$e^{0.06} \approx 1.06$
$e^{0.1} \approx 1.1$
$e^{0.2} \approx 1.2$
$e^{0.4} \approx 1.5$
$e^{0.6} \approx 1.8$

(a) **0.612**   (b) **0.9**

(c) **6.12**   (d) **45**

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(a) **0.612**   (b) **0.9** ✓

(c) **6.12**   (d) **45**
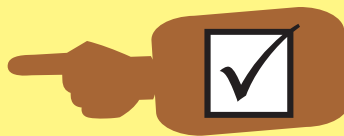
11. At what x does the function $x^3 - 3x$ have a local maximum value?

    (a) 0 and 3

    (b) 0 only

    (c) -1 and 1
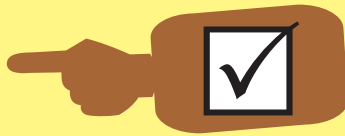
    (d) -1 only

11. At what x does the function $x^3 - 3x$ have a local maximum value?

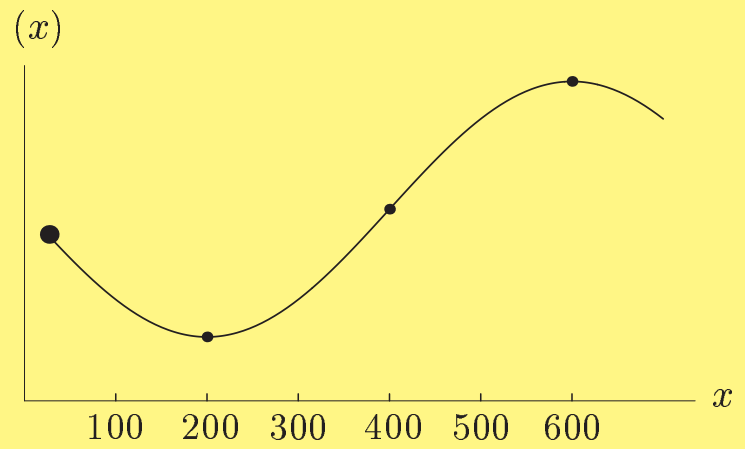   (a) 0 and 3

      (b) 0 only

      (c) -1 and 1

      (d) -1 only ☑

12. For the graph pictured to the right, at which value of x below is there an inflection point?

(a) **10**

(b) **200**

(c) **400**

(d) **600**

12. For the graph pictured to the right, at which value of x below is there an inflection point?

(a) **10**

(b) **200**

(c) **400**

(d) **300** ✓
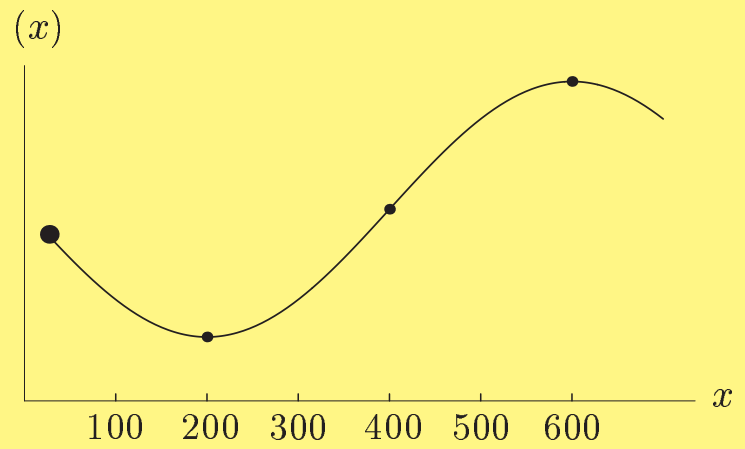
(x)

13. Which of the following is true about the functions $f(x) = (x - 1)^5$ and $g(x) = (x - 1)^6$?

(a) The function $f(x)$ has an inflection point at $x = 1$, but the function $g(x)$ does not.

(b) The function $g(x)$ has an inflection point at $x = 1$, but the function $f(x)$ does not.

(c) Both $f(x)$ and $g(x)$ have an inflection point at $x = 1$.

(d) Neither $f(x)$ nor $g(x)$ haa an inflection point at $x = 1$.

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(d) Neither $f(x)$ nor $g(x)$ haa an inflection point at $x = 1$.

14. A function $f(x)$ has a continuous derivative $f'(x)$ with values indicated in the table below. If $f(x)$ has a local maximum value at $x = A$ and for no other value of x, then which of the following is true?

x	0	1	2	3	4	5	6	7	8	9	10
$f'(x)$	1.5	0.8	0.2	-0.6	-1.2	-2.1	-1.5	-0.7	0.5	1.1	1.8

(a) $0 \leq A \leq 1$

(b) $2 \leq A \leq 3$

(c) $4 \leq A \leq 6$

(d) $7 \leq A \leq 8$

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(a) $0 \leq A \leq 1$

(b) $2 \leq A \leq 3$ ☑

(c) $4 \leq A \leq 6$

(d) $7 \leq A \leq 8$