1. A person running at the speed v miles per hour burns $6v^2 + 10v + 400$ calories per hour. Victor once went for a long, 10-hour run and he was gradually accelerating. His speed t hours after he started was $0.5t + 4$ miles per hour. Express the amount of calories per hour Victor was burning t hours after he started.

   A. $1.5t^2 + 24t + 496$

   B. $1.5t^2 + 29t + 536$

   C. $3t^2 + 5t + 204$

   D. $3t^2 + 53t + 536$

   E. $6t^2 + 58t + 496$

2. Let $f(x) = \dfrac{2x-6}{x^2-9}$. Which of the following are true?

   I. $f(x)$ is continuous at $x = 3$

   II. $\lim_{x \to 3} f(x)$ exists.

   III. $\lim_{x \to -3} f(x)$ exists.

   A. II

   B. I and II

   C. III

   D. II and III

   E. I, II, and III

3. Find the equation of the tangent line to $f(x) = 2x^3 - x^2 + 3x - 3$ at $x = -1$.

   A. $y = -3x - 12$

   B. $y = 7x - 2$

   C. $y = 11x - 2$

   D. $y = 11x + 2$

   E. $y = -9$

4. Find all numbers x such that $f(g(x)) = g(f(x))$, where $f(x) = \frac{1-2x}{x+1}$ and $g(x) = \frac{2}{x-1}$.

A. $x = \frac{1}{5}, x = 2$.

B. No real numbers.

C. $x = 1 + 2\sqrt{5}, x = 1 - 2\sqrt{5}$.

D. $x = -\frac{1}{2}$.

E. $x = -1, x = 10$.

5. An apple crate is shaped like a closed rectangular box with a volume of 3 cubic feet. If the crate is twice as long as it is wide, express its surface area as a function of its width x.

A. $S(x) = 4x^2 + \frac{9}{x}$.

B. $S(x) = 4x^2 + 4x(\frac{3}{2x^2})$.

C. $S(x) = 2x^2 + 3x(\frac{3}{x^2})$.

D. $S(x) = x^2 + \frac{3x}{2}$.

E. $S(x) = 4x^2 + 2x$.

6. Find $\lim_{x \to -\infty} \frac{2x^3 - 3x^2 + x - 3}{2x - 3x^2 - 3}$

A. $\frac{2}{3}$

B. $-\frac{2}{3}$

C. 0

D. $+\infty$

E. $-\infty$

7. A store sells DVDs for \$20 each. At this price, it sells 500 DVDs per month. For every \$1 decrease in the price of DVDs, the store can sell 15 additional DVDs. Express the store's revenue, R, as a function of the sales price of the DVDs, x.

A. $R(x) = (500 + 15x)(x)$

B. $R(x) = (500 + x)(x)$

C. $R(x) = (500 - 15x)(x)$

D. $R(x) = (200 + 15x)(x)$

E. $R(x) = (800 - 15x)(x)$

8. Evaluate $\lim_{x \to 4} \frac{x-4}{\sqrt{x}-2}$

A. 0

B. 1

C. 2

D. 4

E. Limit does not exist

9. Let $f(x) = 3x^{4/3} - 6x^2 + 2$. Find the average rate of change of $f(x)$ with respect to x as x changes from $x = 0$ to $x = 1$.

A. -3

B. -2

C. -6

D. -1/3

E. 4

10. Differentiate $f(x) = \frac{3}{x} + \sqrt{5x}$.

A. $f'(x) = 3 + \frac{1}{2}\sqrt{\frac{5}{x}}$

B. $f'(x) = -\frac{3}{x^2} + \frac{1}{2}\sqrt{\frac{5}{x}}$

C. $f'(x) = 3 + \frac{5}{2\sqrt{x}}$

D. $f'(x) = -\frac{3}{x^2} + \frac{5}{2\sqrt{x}}$

E. $f'(x) = \frac{3}{x^2} + \frac{1}{2}\sqrt{\frac{5}{x}}$

11. Let

$$f(x) = \begin{cases} -4Ax + B, & x \leq -1 \\ A\left(\frac{x^2-4}{x-2}\right), & -1 < x < 2 \\ Bx + 2, & x \geq 2 \end{cases}$$

Find the values of A and B for which $f(x)$ is continuous for all real x values.

A. $A = 0$, $B = -1/2$.

B. $A = -1/6$, $B = -4/3$.

C. $A = 1/5$, $B = -3/5$.

D. $A = 0$, $B = 0$.

E. $A = 1/2$, $B = 0$.

12. Let $f(x) = \sqrt{12 - 4x}$. Hint: Use the limit definition of derivative to find $f'(2)$.

A. $f'(2) = 2$

B. $f'(2) = \dfrac{1}{4}$

C. $f'(2) = 0$

D. $f'(2) = 1$

E. $f'(2) = -1$

13. Find the derivative of $f(x) = \frac{3x-7}{x^2+2}$.

A. $f'(x) = \frac{-6x^2+14x+3}{x^2+2}$

B. $f'(x) = \frac{-3x^2+14x+6}{(x^2+2)^2}$

C. $f'(x) = \frac{-3x^2-12}{(x^2+2)^2}$

D. $f'(x) = \frac{9x^2-14x+6}{(x^2+2)^2}$

E. $f'(x) = \frac{3}{2x}$

14. Simplify the following expression

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

A. $\frac{(x+1)(2x-1)}{(x-2)^2}$

B. $x(x+1)$

C. $(x+1)(x-2)^2$

D. $\frac{3(x+1)}{(x-2)^2}$

E. $\frac{-(x+1)}{(x-2)^2}$

15. An investment was made in 2010, and x years later, the investment returns. $R(x) = x^3 + 2x^2 + 200$ dollars. At what rate was the return increasing in 2012?

A. 10 dollars/year

B. 20 dollars/year

C. 30 dollars/year

D. 40 dollars/year

E. 50 dollars/year