1. Find $\frac{dy}{dx}$ if $y = \frac{3x^2-5}{4x+1}$.

   A. $\frac{dy}{dx} = \frac{12x^2 - 6x + 20}{(4x+1)^2}$

   B. $\frac{dy}{dx} = \frac{-12x^2 + 6x - 20}{(4x+1)^2}$

   C. $\frac{dy}{dx} = \frac{12x^2 + 6x + 20}{(4x+1)^2}$

   D. $\frac{dy}{dx} = \frac{-12x^2 - 6x - 20}{(4x+1)^2}$

   E. $\frac{dy}{dx} = \frac{12x^2 + 6x - 20}{(4x+1)^2}$

2. Find f' if $f(x) = (2x^2-3)(x^3+2x^2)$.

   A. $f'(x) = 12x^3 + 16x^2$

   B. $f'(x) = 10x^4 + 16x^3 - 9x^2 - 12x$

   C. $f'(x) = 4x^4 + 8x^3$

   D. $f'(x) = 6x^4 + 8x^3 - 9x^2 - 12x$

   E. $f'(x) = 2x^5 + 4x^4 - 3x^3 - 6x^2$

3. Find the derivative of y if

$$y = 6\sqrt{x^5} - \frac{3}{2x} + \frac{5+x}{9}$$

   A. $y' = 15x^{3/2} + \frac{6}{x^2} - \frac{1}{9}$

   B. $y' = \frac{12}{5x^{3/5}} + \frac{3}{2x^2} + \frac{1}{9}$

   C. $y' = 15x^{3/2} + \frac{6}{x^2} + \frac{1}{9}$

   D. $y' = \frac{12}{5x^{3/5}} + \frac{6}{x^2} - \frac{1}{9}$

   E. $y' = 15x^{3/2} + \frac{3}{2x^2} + \frac{1}{9}$

4. Find f' if $f(x) = (x^2 - 3)^4(2x + 1)^5$.

A. $f'(x) = (x^2 - 3)^3(2x + 1)^4(5x^2 + 8x - 11)$

B. $f'(x) = 2(x^2 - 3)^3(2x + 1)^4(5x^2 + 8x - 11)$

C. $f'(x) = (x^2 - 3)^3(2x + 1)^4(13x^2 + 4x - 15)$

D. $f'(x) = 2x(x^2 - 3)^3(2x + 1)^4(5x^2 + 8x - 11)$

E. $f'(x) = 2(x^2 - 3)^3(2x + 1)^4(13x^2 + 4x - 15)$

5. Find $\dfrac{dy}{dx}$ if: $3x^2y - 2y^3 - 5x = 1 - y$

A. $\dfrac{dy}{dx} = \dfrac{5 - 6xy}{3x^2 - 6y^2 + 1}$

B. $\dfrac{dy}{dx} = \dfrac{5}{6x - 6y^2 + 1}$

C. $\dfrac{dy}{dx} = \dfrac{4}{6x - 6y^2}$

D. $\dfrac{dy}{dx} = \dfrac{4 - 6xy}{3x^2 - 6y^2}$

E. $\dfrac{dy}{dx} = \dfrac{5}{3x^2 + 6x - 6y^2 + 1}$

6. Suppose f and g are functions differentiable at $x = 2$. Find $h'(2)$ if $h(x) = \dfrac{x^2 - f(x)}{g(x) + 1}$ and $f(2) = 5,\ g(2) = -3,\ h(2) = 1,\ f'(2) = -2,\ g'(2) = 4$.

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

B. -4

C. $\frac{6}{5}$

D. -2

E. $-\frac{8}{25}$

7. Find f'' if $f(x) = (4x^2 - 5)^3$.

A. $f''(x) = 24(4x^2 - 5)(20x^2 - 5)$

B. $f''(x) = 64(4x^2 - 5)(x^3 + 1)$

C. $f''(x) = 384x^2(4x^2 - 5)$

D. $f''(x) = 6(4x^2 - 5)$

E. $f''(x) = 48(4x^2 - 5)(x + 12)$

8. Find an equation of the line tangent to the graph of f when $x = 2$, if:

$$f(x) = 3\sqrt{4x^2 - x - 5}$$

A. $y = \frac{1}{2}x + 8$

B. $y = \frac{15}{2}x - 6$

C. $y = \frac{3}{8}x + \frac{33}{4}$

D. $y = \frac{15}{2}x - 24$

E. $y = \frac{1}{2}x - 10$

9. Find the x–coordinate of any point(s) on the graph of f where the slope of the tangent line to f is 7 if:

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

A. $x = -\frac{10}{3}$, $x = 2$

B. $x = -1$, $x = -\frac{1}{3}$

C. $x = \frac{21}{2}$

D. $x = \frac{2}{3}$, $x = 6$

E. $x = \frac{16}{3}$, $x = 20$

10. It costs a city $C(x) = \dfrac{2}{100 - 1.3x}$ dollars to purify a gallon of water so it is x percent pure. Find the rate at which purification costs are changing when the desired purity is 80 percent.

A. decreasing \$0.1625 per percentage purity

B. decreasing \$0.125 per percentage purity

C. increasing \$0.1625 per percentage purity

D. increasing \$0.125 per percentage purity

E. decreasing \$0.50 per percentage purity

11. The demand for a product is given by $D(p) = \dfrac{5390}{p}$ units per month, where p is the price per unit in dollars. It is projected that t months from now, the price of the product will be $p(t) = 0.4t^{3/2} + 3.8$ dollars per unit. Find the rate at which monthly demand will be changing with respect to time 4 months from now.

A. increasing 132 units per month

B. decreasing 110 units per month

C. increasing 770 units per month

D. increasing 110 units per month

E. decreasing 132 units per month

12. The concentration, C, of a drug x hours after being administered is

$$C(x) = \frac{5x}{9+x^2} \text{ units}$$

If the drug is administered at 5:00 a.m., use increments to estimate the change in concentration from 7:00 a.m. to 7:15 a.m.

A. 0.800 units

B. 0.025 units

C. 0.100 units

D. 0.037 units

E. 0.544 units

13. The cost of producing x units of an item is $C(x) = 0.4x^2 + 3x + 40$ dollars. The price at which all x units will be sold is $p(x) = 22.2 - 1.2x$ dollars. Find the actual revenue from the sale of the 4th unit, to the nearest cent.

A. \$11.20

B. \$18.00

C. \$16.60

D. \$13.80

E. \$11.40