1) If $f(x)=5x^2-2$, find and simplify the difference quotient $\dfrac{f(x+h)-f(x)}{h}$.

A. $2x+5h$
B. $10x+h$
C. $5h$
D. $10x+5h$
E. $2x+h$

2) Find $\dfrac{dy}{dx}$ where $y=\dfrac{2}{3}x-\sqrt{x}+\dfrac{1}{x^3}$.

A. $\dfrac{dy}{dx}=\dfrac{2}{3}-\dfrac{1}{2\sqrt{x}}+\dfrac{1}{3x^2}$
B. $\dfrac{dy}{dx}=-\dfrac{2}{3}-\dfrac{1}{\sqrt{x}}-\dfrac{3}{x^4}$
C. $\dfrac{dy}{dx}=-\dfrac{2}{3}-\dfrac{1}{2\sqrt{x}}-\dfrac{3}{x^4}$
D. $\dfrac{dy}{dx}=\dfrac{2}{3}-\dfrac{1}{\sqrt{x}}+\dfrac{1}{3x^2}$
E. $\dfrac{dy}{dx}=\dfrac{2}{3}-\dfrac{1}{2\sqrt{x}}-\dfrac{3}{x^4}$

3) If $j(x)=\left(x-\frac{1}{x}\right)(3x^2+1)$, then $j'(x)=$ which choice?

A. $9x^2+\dfrac{1}{x^2}-2$
B. $9x^2+5$
C. $3x^3-2x+\dfrac{1}{x}$
D. $6x^2+6$
E. $9x^2+\dfrac{1}{x^2}-8$

4) Find the *x*-coordinate only of any point(s) at which the graph of the function *f* below would have a horizontal tangent line.

$$f(x)=\frac{2}{3}x^3+x^2-12x-6$$

A. $x=-3,\ 2$
B. $x=-12$
C. $x=-3,\ 0,\ 2$
D. $x=12$
E. $x=-2,\ 3$

5) The revenue, in dollars, from selling *x* DVD players is $R(x)=100x+\frac{3000}{x}$. Use the marginal revenue function to estimate the additional revenue from the sale of the 11^{th} unit once 10 units have been sold.

A. \$74.00
B. \$72.73
C. \$70.00
D. \$74.79
E. \$72.00

6) Find the following limit. $\lim_{x\to 2}\left(\frac{x^2-7x+10}{x^2-4}\right)$

A. $-\frac{3}{4}$
B. 0
C. $-\frac{5}{2}$
D. 1
E. This limit does not exist.

7) Find the following limit. $\lim_{h\to 0}\left(\frac{2(x+h)^2-(x+h)+3-(2x^2-x+3)}{h}\right)$

A. -1
B. $4x+1$
C. $1-4x$
D. $-4-4x$
E. $4x-1$

8) Find the slope of the line tangent to the graph of $g(x)=x+\frac{1}{x}$ at the point $\left(2,\frac{5}{2}\right)$.

A. $m=-\frac{3}{4}$
B. $m=\frac{3}{4}$
C. $m=-1$
D. $m=1$
E. $m=\frac{5}{4}$

9) Find the **average** rate of change of the function $f(x)=x^2-2x^{3/2}$ on the interval [1, 9].

A. 1.25
B. 3.5
C. 3.25
D. 1
E. 9.5

10) Find the equation of the line tangent to the graph of $y = 3x^3 - 2x^2 + 7x - 5$ at the point $(-1, -17)$.

A. $y = 17x + 288$
B. $y = 17x$
C. $y = 20x - 3$
D. $y = 20x + 3$
E. $y = -20x + 3$

11) The number of bacteria *N* (in millions) found in a culture after *t* hours, is given by the function $N(t) = 3t(t-10)^2 + 40$. How is the population of bacteria changing after 8 hours? Hint: Rewrite the function *N* as a polynomial.

A. It is decreasing by 84 million/hour
B. It is increasing by 84 million/hour
C. It is decreasing by 44 million/hour
D. It is decreasing by 96 million/hour
E. It is increasing by 96 million/hour

12) Find the slope of the line tangent to the graph of $g(x) = \left(2x + \frac{8}{x^2}\right)\left(x^2 - x\right)$ at the point (2, 12).

A. $m = 26$
B. $m = 18$
C. $m = 0$
D. $m = 14$
E. $m = 20$

13) Complete the table below to find the following limit. $\lim_{x\to 2} f(x)$ where $f(x)=\left(\frac{x^3-2x-4}{x-2}\right)$

x	1.9	1.99	1.999	2.001	2.01	2.1
$f(x)$						

A. 9.7
B. 9.8
C. 9.9
D. 10.0
E. 10.1

14) Find the following limit. $\lim_{x\to -\infty}\left(\frac{2x^2+3x-1}{3x^2+5}\right)$

A. $-\frac{2}{3}$
B. $\frac{3}{2}$
C. 0
D. ∞
E. None of the above.

15) Find the following limit. $\lim_{x\to 0}\left(\frac{\sqrt{x+9}-3}{x}\right)$

A. 6
B. 1
C. $\frac{1}{6}$
D. 0
E. The limit does not exist.

16) Find an equation of the line tangent to $f(x) = 2x^2 - \sqrt{x} + 2$ at the point (1, 3). Write the equation in standard form.

A. $11x - 2y = 5$
B. $7x - 2y = 13$
C. $11x - 2y = 31$
D. $7x - 2y = 1$
E. $7x - 2y = -6$

17) The weekly profit function for a certain grain business is given by $P(x) = 10x + 15x^2$, where x is in pounds and profit P is in dollars. Find the <u>average</u> rate of change of profit in the interval [6, 7]. Find the <u>marginal profit</u> when x is 6 pounds. **How much greater** is the <u>average</u> rate of change in profit you found than the <u>marginal profit</u> at x = 6 pounds that you found?

A. \$10
B. \$15
C. \$20
D. \$25
E. \$30