Practice Problems for Derivatives Quiz 1

Name:

AP Calculus

The quiz will be about 25 points and you will NOT be using a calculator!!!

For each multiple choice problem, <u>SHOW YOUR WORK</u> and circle the best answer.

1) A hanging spring with a weight at the bottom is compressed and then released so that it bounces up and down. A cosine function models the motion of the spring, with y as vertical displacement and x as time. What is the instantaneous rate of change of the spring given the sinusoidal model below.

$$y = 4\cos(\frac{5\pi}{2}x)$$

(A)
$$4\pi \cos\left(\frac{5\pi}{2}x\right)$$
 (B) $4\sin\left(\frac{5\pi}{2}x\right)$ (C) $-4\sin\left(\frac{5\pi}{2}x\right)$
(D) $-10\pi \sin\left(\frac{5\pi}{2}x\right)$ (E) $10\pi \sin\left(\frac{5\pi}{2}x\right)$

2) If
$$y = \tan^{5}(2x)$$
 then $\frac{dy}{dx}$ is:
(A) $\sec^{10}(2x)$ (B) $10\sec^{10}(2x)$ (C) $5\tan^{4}(2x)$
(D) $10\tan^{4}(2x)$ (E) $10\tan^{4}(2x)\sec^{2}(2x)$

3) If
$$f(x) = \sqrt[3]{x^3 - x}$$
 then $f'(2)$ is approximately:
(A) 1.110 (B) 2.245 (C) 0.101
(D) 12.107 (E) 18.161

4) The
$$\lim_{h \to 0} \frac{\ln(x-3+h) - \ln(x-3)}{h}$$
 is

(A)
$$\ln(x+3)$$
 (B) $\ln(x-3)$ (C) $\frac{1}{\ln(x-3)}$
(D) $\frac{1}{(x+3)}$ (E) $\frac{1}{(x-3)}$

5) Find the derivative of each function below using the limit definition of the derivative.

a)
$$f(x) = 3x - x^2$$
 b) $g(x) = \frac{3}{x}$

6) Find the equation of the line that's tangent to the function $y = 2^{x^3 + 3x}$ at x = 1. (Leave answers in exact form.)

7) Find the derivative of
$$f(x) = \frac{e^x}{\sin(x)}$$
. Then evaluate $f'(\frac{\pi}{2})$

8) Find the derivative of
$$g(x) = \sqrt{\ln x}$$
 . Then evaluate $g'(e)$

9) Find the derivative of
$$h(x) = e^{-4x} + 5 \ln(\cos x)$$
. Then evaluate $h'(\frac{\pi}{4})$

10) Explain using complete sentences why the expression below represents the derivative of a function. Write in complete sentences and feel free to supply a sketch of a graph to illustrate the situation.

$$\lim_{x \to c} \frac{f(x) - f(c)}{x - c}$$

11) Describe the function $y = x^3 - 4x$. Find all critical points, extrema, describe the concavity, etc. See the first homework for more guidance on describing the function.