Derivative Worksheet

For problems 1-8 find the derivative of y with respect to x (i.e. $\frac{dy}{dx}$). Complete the assignment on a separate piece of paper.

1. $y = 5$

2. $y = x^4$

3. $y = 7x^8 + 9x^4 + 3x - 15$

4. $y = (2x^3 - 4x^2)(3x^5 + x^2)$

5. $y = \frac{3}{x^5}$

6. $y = 5\cos x$

7. $y = 3\sin x - 2\cos x$

8. For the equation $y = x^2 - 4x - 3$ find
   (a) the equation of the slope of its tangent line at any point.
   (b) the equation of the tangent line at point (4,3) in slope intercept form.

9. A particle undergoes straight-line motion with its displacement at any time given by the following equation, $X(t) = 2t^3 - 4t^2 + 2t + 1$
   (a) Find the times when the particle is motionless.
   (b) Find the time interval when the particle is moving to the right.
   (c) Find the time interval when the particle is moving to the left.
   (d) Find the time(s) with the particle is not moving.

10. The velocity of a particle moving along the x-axis for $t \geq 0$ is given by $v_x = 24 - 3t^3$.
    (a) What is the particle's acceleration when it first achieves a velocity of zero?
    (b) What is the particle's acceleration when it achieves its maximum displacement in the +x-direction?

Table of Derivatives

1. $\frac{d}{dx}(const.) = 0$

2. $\frac{d}{dx}(x) = 1$

3. $\frac{d}{dx}(x^n) = nx^{n-1}$

4. $\frac{d}{dx}\left[cf(x)\right] = c\frac{d}{dx}\left[f(x)\right]$

5. $\frac{d}{dx}\left[f(x)+g(x)\right] = \frac{d}{dx}\left[f(x)\right]+\frac{d}{dx}\left[g(x)\right]$

6. $\frac{d}{dx}\left[f(x)-g(x)\right] = \frac{d}{dx}\left[f(x)\right]-\frac{d}{dx}\left[g(x)\right]$

7. $\frac{d}{dx}\left[f(x)g(x)\right] = f(x)\frac{d}{dx}\left[g(x)\right]+g(x)\frac{d}{dx}\left[f(x)\right]$ (The Product Rule)

8. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)\frac{d}{dx}\left[f(x)\right]-f(x)\frac{d}{dx}\left[g(x)\right]}{\left[g(x)\right]^2}$ (The Quotient Rule)

9. $\frac{d}{dx}(\sin x) = \cos x$

10. $\frac{d}{dx}(\cos x) = -\sin x$

11. $\frac{d}{dx}(\tan x) = \sec^2 x$

12. $\frac{d}{dx}(\ln x) = \frac{1}{x}$

13. $\frac{d}{dx}e^x = e^x$