AP Calculus Chapter 2 Review Worksheet

Non- Calculator Problems.

1.
$$\frac{d}{dx} \left(7x^4 - \frac{1}{x^3} + 5\sin x \right)$$
 2. $\frac{dy}{dx} \left(17x^4 \cos x \right)$

3. Find
$$f'(x)$$
 if $f(x) = \frac{x^2 - 1}{x - 1}$
4. Given $f(t) = \frac{4t^2 - t}{\tan(t)}$, find $f'(t)$

5. Find
$$f'(1)$$
 if $f(x) = (x^4 - x^2)(2x^3 + x)$.
6. Find $\frac{dy}{dx}\Big|_{x=2}$ if $y = \frac{x^2 + 2x}{x^4 - x^3}$

7. Find
$$\frac{d}{dt}$$
 at $t = 1$ if $y = \frac{t^6 + 2}{t^6 - 2}$
8. Find $\frac{dy}{d\theta}$ if $y = \sin^6 \theta$

9. Find
$$\frac{dy}{dx}$$
 if $y = \sqrt{\sin 3x}$ 10. If $f(x) = (3x^5 - 2)^8$ Find $f'(x)$

11. Find y' if
$$y = 4\cos^3(7x)$$
 12. Find $\frac{dy}{dx}$ if $y = \sin(\cos(\sqrt{x}))$

13. Find
$$\frac{dy}{dx}$$
 at (1,1) if $x^{\frac{1}{2}} + y^{\frac{1}{2}} = 2y^2$ 14. Find $\frac{dy}{dx}$ at (2,1) if $\frac{x+y}{x-y} = 3$

15. Find
$$\frac{d^2 y}{dx^2}$$
 given $x^3 - 8y^3 = 60$ 16. Find $\frac{d^2 y}{dx^2}$ if $\cos y = \sin x + 1$

18. Find $\lim_{\Delta x \to 0} \frac{\sin\left(\frac{\pi}{3} + \Delta x\right) - \sin\left(\frac{\pi}{3}\right)}{\Delta x}$

to the graph of
$$y = \frac{x^2 + 4}{x - 6}$$
 at $x = 5$.

19. Find the values of x where the tangent to the graph of
$$y = 2x^3 - 8x$$
 has a slope equal to the slope of $y = x$.

- 20. Find the coordinates where the tangent to the graph of $y=8-3x-x^2$ is parallel to the x-axis.
- 21. Find the equation of the normal line to the graph of $y = \cos(4x)$ at $x = \frac{\pi}{12}$.

22. Given
$$u(0) = 5$$
 $u'(0) = 3$ $v(0) = -1$ $v'(0) = 2$
 $u'(-1) = 8$ $v'(-1) = -3$ $u'(5) = -2$ $v'(5) = 4$

Find $\frac{d}{dx}$ at x = 0 for the following functions.

a)
$$y = 7v - 2u$$
 b) $y = uv$

c)
$$y = \frac{u}{v}$$
 d) $y = v(u)$

Calculator Problems

23. Evaluate with your calculator y'(7.6), given $y = 3x^2 \ln x$.

24. Use your calculator to find
$$f'\left(\frac{\pi}{5}\right)$$
, given $f(t) = 5\tan(x) + \sin^3(x^2)$.

25. Find the equation of the tangent line to the graph of $y = \cos^2(4x)$ at $x = \frac{\pi}{10}$.

- 26. Given $s(t) = t^2 \sin t$, $t \ge 0$, where s(t) is the position of a particle in meters after t seconds of motion.
 - a) Find the velocity function v(t).
 - b) Find the acceleration function a(t).
 - c) Evaluate v(4) and a(4) Evaluate v(6) and a(6)
 - d) What do your answers in part (c) tell you about the speed of the particle at those times
- 27. Given the position function $s(t) = -16t^2 + 14t + 525$. Time is in seconds and distance is in feet.
 - a) Find the average velocity from 3 seconds to 4 seconds.
 - b) Find the velocity at 4 seconds.
 - c) Find the velocity when the object strikes the ground.

Related Rates

28. A spherical balloon is inflating at a rate of $27\pi in^3/\text{sec}$. How fast is the radius of the balloon increasing when the radius is 3 in? Recall the volume of a sphere is $V = \frac{4}{3}\pi r^3$.

29. A cylindrical tank with a radius of 6 meters is filling with a fluid at a rate of 108π m³ / sec. How fast is the height increasing?

- 30. A boat is being pulled toward a dock by a rope attached to its bow through a pulley Attached to a pole on the dock 7 feet above the bow. If the rope is hauled in a rate of 4 ft/sec.
 - a) How fast is the boat approaching the dock when 25 feet of rope is out?

b) What is the rate of change for the angle between the rope and the pulley on the dock when there is 25 feet of rope between the pulley and the boat.