My BIG 2011 Derivative Review

Can't remember how to do #1 – 5, then go to:
http://homework.zendog.org/limitasderivative.pdf

1. $\lim_{h\to 0} \dfrac{\ln(x+h)-\ln(x)}{h}$

2. $\lim_{h\to 0} \dfrac{\dfrac{1}{x+h}-\dfrac{1}{x}}{h}$

3. $\lim_{x\to \frac{\pi}{4}} \dfrac{\sec(x)-\sec\left(\frac{\pi}{4}\right)}{x-\frac{\pi}{4}}$

4. $\lim_{h\to 0} \dfrac{(7+h)^3-7^3}{h}$

5. $\lim_{h\to 0} \dfrac{e^{2(x+h)}-e^{2x}}{h}$

Find the derivatives of the following functions:

6. $y=\sin(x)$

7. $y=\sin(5x)$

8. $y=\sin\left(x^2\right)$

9. $y=\arcsin(x)$

10. $y=\arcsin(5x)$

11. $y=\sin^2(x)$

12. $y=\sqrt{\sin(x)}$

13. $y=\sin\sqrt{x}$

Implicit Differentiation

Find $\frac{dy}{dx}$ of the following:

14. $3x^2 + 2xy + y^2 = 24$

15. $\left(x^2 + y^2\right) = x^2 - y^2$

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

17. $\tan(xy) + e^{xy} = 1$

18. $\ln(xy) + \sqrt{y} = 1$

Related Rates

Can't remember – go to http://homework.zendog.org/implicitreview.pdf

19. While under his cloak of invisibility, Harry Potter throws a snowball at Draco Malfoy. If the snowball is melting at the rate of 10 cubic centimeters per minute, at what rate is the radius changing when the snowball's radius is 12 centimeters?

20. Cho Chang is traveling north towards an intersection on her Comet 260 [flying broomstick] at a rate of 60 kilometers per hour, while Harry Potter is traveling east away from the intersection on his Nimbus 2000 [flying broomstick] at a rate of 50 kilometers per hour. Find the rate of change between Cho and Harry when Cho is 3 kilometers south of the intersection and Harry is 4 kilometers east of the intersection.

21. In Potions Class, a potion runs into a conical container at the rate of $9\ cm^3/\min$. The cone stands point down and has a height of 10 cm and a base radius of 5 cm. How fast is the potion level rising when the potion is 6 cm deep?

22. Harry has accidentally turned his Aunt Marge into a balloon. Aunt Marge is rising vertically above a level, straight road at a constant rate of 1 m/sec. Just when the balloon is 65 meters above the ground, a bicycle moving a constant rate of 17 m/sec passes under Aunt Marge. How fast is the distance between Aunt Marge and the bicycle increasing 3 seconds later?