Exam 1 Review Problems

1. Write the equation of the perpendicular line to $x-3y=9$ that passes through the point, (4, 1). Sketch the graph of both lines. Give coordinates of the x-intercept and y-intercept for both graphs.

2. $\lim_{x\to 5}\dfrac{2x-10}{x^2-25}$

3. $\lim_{x\to 6}\dfrac{x^2-6x}{x^2-5x-6}$

4. Determine the equation of the tangent line to the curve $y=3x^3-5x^2+x+3$ at x = 1

5. Liquid is pouring into a large vat. After t hours, there are $5t-\sqrt{t}$ gallons in the vat. At what rate is the liquid flowing into the vat (in gallons per hour) when t = 4?

6. A toy rocket fired straight up into the air as height $s(t)=160t-16t^2$ feet after t seconds.

(a) What is the rocket's initial velocity (when t = 0)?
(b) What is the velocity after 2 seconds?
(c) At what time will the rocket hit the ground?
(d) At what velocity will the rocket be traveling just as it smashes into the ground?

7. A helicopter is rising at a rate of 32 feet per second. At a height of 128 feet, the pilot drops a pair of binoculars. After t seconds, the binoculars have height $s(t) = -16t^2 + 32t + 128$ feet from the ground. How fast will they be falling when they hit the ground?

8. Differentiate Implicitly:

a) $x^2-y^2=1$

b) $x^3+y^3-6=0$

9. Differentiate:

a) $y=(4x-1)(3x+1)^4$

b) $y=\dfrac{x^2-6x}{x-2}$

10. The worldwide rate of cigarette consumption (in trillions of cigarettes per year) since 1960 is given approximately by the function c(t) = 0.1t + 2.4, where t = 0 corresponds to 1960. Determine the number of cigarettes sold from 1980 to 1998.

11. After t hours of operation, an assembly line is producing power lawn mowers at the rate of $r(t)=21-\dfrac{4}{5}t$ mowers per hour. How many mowers are produced during the time from t = 2 to t = 5 hours?

12. Determine the average value of the function:

a) $f(x) = x^2$; [0,3]

b) $f(x) = 1 - x$; [–1,1]

13. $\int_1^2 (x^2-3x+2)dx$

14. $2\int \dfrac{x^5+3x^4-1}{x^2}\,dx$

15. Integrate using substitution:

a) $\int 2x(x^2+4)^5 dx$

b) $\int 24(x^2-2x+1)(x^3-3x^2+3x-7)^3\,dx$

16. Your cell phone company gives you a discount the more data you stream to your phone according to: $40=\frac{1}{3}x^3+x^2+3p^2+4p$, where p is the price in dollars and x is the amount of data streamed in Gb. When you have paid \$40 to stream 12 GB at 0.3 Gb/hr., how fast is the amount per Gb they charge dropping?