Math 120, Winter 2009. Answers to Unit Test 2 Review Problems – Set A.

Brief Answers. (These answers are provided to give you something to check your answers against. Remember than on an exam, you will have to provide evidence to support your answers and you will have to explain your reasoning when you are asked to.)

1.(a) $dy/dx = -(1 + y)/(1 + x)$.

1.(b) $dy/dx = 1/25$.

1.(c) $dy/dx = (1 - y)/(x - 3)$.

1.(d) $dy/dx = (ax)/(by)$.

2.(a) $z = \sqrt{0.25 + x^2}$.

2.(b) 0.693 km/minute.

2.(c) 0.4 radians per minute.

3.(a) 60750 square miles.

3.(b) 74250 square miles.

3.(c) $N = (135000)(0.9419682592)^t$.

3.(d) Decreases by 5.8% per year.

3.(e) In the year 2039 or 2040 (depending on how your round).

4.(a) $y = 1$. (This is a horizontal line.)

4.(b) $y - 1 = (-5/4)(x - 1)$.

4.(c) $y = 0.5x - 1.5$.

4.(d) $y = 2$. (This is a horizontal line.)

5.(a) $x \approx 5.918$.

5.(b) $x \approx 0.1747$.

5.(c) $x \approx 5.2$.

5.(d) $x = 100$.

6.(a)   (I)   4.

          (II)   2.8.

          (III)   1.

          (IV)   0.714.

6.(b) $y - 8 = 5.5(x - 3)$.

6.(c) $y - 3 = (1/5.5)(x - 8)$.

7.   The distance is increasing at approximately 398.103 miles per hour.

8.(a)   The limit is equal to 0.5.

8.(b)   The limit is equal to –2.

8.(c)   The limit is equal to zero.

8.(d)   This limit does not exist. (L'Hopital's rule does not apply here.)

9.   Approximately 17.78 feet per second.

10.   The relative rate of volume is greater. This is because if the side length of the cube is L, then $V = L^3$ and the rate of change of the volume is:

$$\frac{dV}{dt} = 3L^2 \frac{dL}{dt},$$

so that the relative rate of change of volume is given by $\dfrac{1}{V}\dfrac{dV}{dt} = \dfrac{1}{L^3} 3L^2 \dfrac{dL}{dt} = \dfrac{3}{L}\dfrac{dL}{dt}$.

Next, the surface area of the cube is given by $A = 6L^2$, so that the rate of change of the surface area is:

$$\frac{dA}{dt} = 12L \frac{dL}{dt},$$

so that the relative rate of change of the area is given by $\dfrac{1}{A}\dfrac{dA}{dt} = \dfrac{1}{6L^2} 12L \dfrac{dL}{dt} = \dfrac{2}{L}\dfrac{dL}{dt}$.