Math 2320 - Practice Test 1

1 Computing the Integral with the Definition

1. Approximate $\int_0^1 2x^2 + 1\,dx$ using three rectangles and the right hand method.
2. Compute $\int_0^1 2x^2 + 1\,dx$ (use the definition and not the FTC).
3. Compute $\int_{-1}^2 1 - 4x\,dx$ (use the definition and not the FTC).

2 Fundamental Theorem of Calculus

1. Compute the following derivatives using the FTC part I.
   (a) $\dfrac{d}{dx}\left[\displaystyle\int_1^x f(t)dt\right]$
   (b) $\dfrac{d}{dx}\left[\displaystyle\int_1^{x^2} f(t)dt\right]$
   (c) $\dfrac{d}{dx}\left[\displaystyle\int_x^{3x-1} \sin(t-1)dt\right]$
2. Compute the following integrals using the FTC part II (do they look familiar).
   (a) $\displaystyle\int_0^1 2x^2 + 1\,dx$
   (b) $\displaystyle\int_{-1}^2 1 - 4x\,dx$

3 Integration with Substitution

1. $\displaystyle\int x^2(x^3+1)^{2/3}\,dx$
2. $\displaystyle\int x^2(x^3+1)^{-1}\,dx$
3. $\displaystyle\int x^2\sin(x^3)\,dx$

4. $\int \cos(2x)\sin(2x)\,dx$

5. $\int \tan(3x)\sec^2(3x)\,dx$

6. $\int \frac{e^x}{1+e^x}\,dx$

7. $\int \frac{e^x}{1+e^(2x)}\,dx$

8. $\int \frac{\ln(x)+1}{x}\,dx$

9. $\int \sin^3(x)\,dx$

4 Applications of the integral: Average Value and the MVT and Acceleration, Velocity and Displacement

1. Find the average value of the function $f(x) = x^3$ over the interval $[a, b] = [0, 3]$.

2. Find the average value of the function $f(x) = x^{2/3}$ over the interval $[a, b] = [-1, 1]$.

3. For function $f(x) = x^3$ over the interval $[a, b] = [0, 3]$ find the c from the MVT.

4. For function $f(x) = x^{2/3}$ over the interval $[a, b] = [-1, 1]$ find the c from the MVT.

5. Let $a(t) = t^2 - 1$, $v(0) = 1$ and $s(0) = 8$. Find the function $s(t)$.

6. Let $a(t) = 8e^{2t}$, $v(0) = 20$ and $s(0) = 40$. Find the function $s(t)$.

7. Let $a(t) = -9.8$, $v(0) = 40$ and $s(0) = 0$. Find position at the time $t = 3$.

5 Area and Volume

1. Let $f(x) = x^3$. Find the area between the curve and the x-axis over the interval $[-1, 2]$.

2. Find the area between the functions $f(x) = x^3$ and $f(x) = 9x$ in the first quadrant.

3. Find the area between the functions $x = y^2$ and $y = -2 + x$.

4. Find the area between the functions $f(x) = \sin(x)$, $y = \cos(x)$, $x = 0$ and $x = \pi/4$.

5. Define the region by $y = x^2$, $x = 0$ and $y = 7$ in the first quadrant. Find the volume of this region by revolving the region around the x-axis (use Discs).

6. Define the region by $y = x^2$, $x = 0$ and $y = 7$ in the first quadrant. Find the volume of this region by revolving the region around the y-axis (use Discs).

7. Define the region by $y = x^2$, $x = 0$ and $y = 7$ in the first quadrant. Find the volume of this region by revolving the region around the x-axis (use Shells).

8. Define the region by $y = x^2$, $x = 0$ and $y = 7$ in the first quadrant. Find the volume of this region by revolving the region around the y-axis (use Shells).

9. Define the region by $y = \ln(x)$, $x = 0$, $y = -1$ and $y = 2$. Find the volume of this region by revolving the region around the y-axis.

10. Define the region by $y = x^2/8$, $y = 2 - x$ and $x = 0$ in the first quadrant. Find the volume of this region by revolving the region around the y-axis.

11. Define the region by $y = \frac{1}{x+1}$, $y = 1 - x/3$ and $x = 0$. Find the volume of this region by revolving the region around the x-axis.