Math 241
Fall 2018
Exam 3 - Practice
11/16/18
Time Limit: 50 Minutes

Name (Print): _____

Problem	Points	Score
1	20	
2	20	
3	20	
4	80	
5	15	
6	15	
7	20	
8	20	
9	20	
Total:	230	

1. (20 points) a) In the space below, draw a reasonable sketch of $f(x) = \sqrt{x} + 1$ twice (so like two separate graphs that are the same). Then draw 3 equal width rectangles associated to right hand (Riemann) sum approximation over the interval $[0, 9]$ on one of the graphs, and draw 3 equal width rectangles associated to left hand (Riemann) sum approximation over the interval $[0, 9]$ on the other graph.

b) Express the areas above in sigma notation.

c) For both approximations, determine if they are an overestimate or an underestimate (you don't need to compute anything here, just make you decision based on your drawings in part a).

2. (20 points) Suppose that a particle has an acceleration function $a(t) = 12t^2 + 2$. If the velocity function, $v(t)$ has the property that $v(1) = 1$, and the position function, $p(t)$, has the property that $p(1) = 0$, find explicit formulas for $v(t)$ and $p(t)$.

3. (a) (10 points) Set up a definite integral which gives the area of a circle with radius 2.

(b) (10 points) Let $G(x) = \int_1^x 1 - t^2 \, dt$. Determine the intervals of increase/decrease and concavity for G.

4. (a) (10 points) $\int \frac{2}{\sqrt[3]{x}} + 5x \; dx$

(b) (10 points) $\int \frac{1}{\sqrt{x}} + \cos(2x+1) + 2 \; dx$

(c) (10 points) $\int \left(\frac{1}{x^2} + 1\right)^2 \; dx$

(d) (10 points) $\int_1^2 \frac{x+1}{(x^2+2x)^3} \; dx$

(e) (10 points) $\int_0^{1/2} 7\sqrt{\sin(\pi x)}\cos(\pi x) \; dx$

(f) (10 points) $\int_0^1 (x+1)^{50} x \; dx$

(g) (10 points) $\int \frac{x^2+2x+1}{x^{3/2}} \; dx$

(h) (10 points) $\int 3\sec^2(\sin^2(x))\sin(x)\cos(x) \; dx$

5. (15 points) Find the area of the region bounded by $f(x) = \dfrac{1}{x^2}$, $g(x) = 3x$ and $h(x) = x$.

6. (15 points) Let $F(x) = \int_x^{x^2} \cos(t^3)\, dt$. Determine $F'(x)$.

7. (a) (10 points) Find $\int_{-4}^{3} |x^2 - 1| \, dx$.

(b) (10 points) Find $\displaystyle\int \frac{\sqrt{\sqrt{\sin(x)} + 1}\cos(x)}{\sqrt{\sin(x)}} \, dx$

8. (20 points) a) Give all values of b such that $\int_1^b 3x^2 - 3 \, dx = 0$.

b) Set up integrals which give area of the region bounded by the first quadrant and the lines $y = \sqrt{x}$ and $y = x - 2$. One integrating with respect to x and the other integrating with respect to y.

9. (20 points) Let R be the region bounded by $y = \sqrt{8x}$ and $y = x^2$. Using whatever method you like, set up the integral that gives the volume of this region rotated about the given line:

The x-axis

The y-axis

y=-1

x=-2

y=5

x=3

Extra Credit: Rotate the region from question 5 about the line $y = -x - 1$ and find the volume of the resulting solid. Note: this is very hard.