

## MATH 2320 Practice Test 1

Name: \_\_\_\_\_

### 1 Anti Derivative and u sub

1. Compute the following Integrals

(a)  $\int \sqrt{3x} + 4 \sec(x) \tan(x) - \frac{2}{\sqrt{1-x^2}} dx$

(b)  $\int \frac{3x^2 - 4\sqrt{x} + 3}{x} dx$

(c)  $\int \csc(x) [\cot(x) + \sin(x)] dx$

(d)  $\int \frac{x}{1+x^2} dx$

(e)  $\int \frac{x}{1+x^4} dx$

(f)  $\int \frac{e^x}{1+e^{2x}} dx$

(g)  $\int \sin^3(2x) \cos(2x) dx$

(h)  $\int \sin(3x) \cos^{1/2}(3x) dx$

(i)  $\int \sin(x) \sec^2(\cos(x)) dx$

### 2 Definition of the integral

2. Let  $f(x) = 3x + 4$  over the interval  $[1, 6]$ . Let  $n = 5$ .

- (a) Graph the function with  $n$  regions. Label the important points on the graph.
- (b) Compute the LH rule Riemann sum.
- (c) Compute the RH rule Riemann sum.

3. Using the **definition** of the integral compute

$$\int_1^4 3x - 2 dx.$$

4. Using the **FTC II** compute

$$\int_1^4 3x - 2 \, dx.$$

5. Using the **FTC I** compute

(a)  $\frac{d}{dx} \left[ \int_4^{x^2} f(t) \, dt \right]$

(b)  $\frac{d}{dx} \left[ \int_4^{3x+2} e^{t^3} \, dt \right]$

(c)  $\frac{d}{dx} \left[ \int_x^{2x} f(t) \, dt \right]$

6. For  $f(x) = x^3$  and  $[0, 3]$  find  $f_{ave}$ . And find the  $c$  from the MVTI.  
7. For  $f(x) = 1 + x^2$  and  $[-2, 0]$  find  $f_{ave}$ . And find the  $c$  from the MVTI.

### 3 Application of the integral

8. Velocity, Acceleration and Position

(a) Let  $a(t) = -5\sin(t)$ ,  $v(0) = 5$  and  $s(0) = -7$ .

i. Find  $v(t)$  and  $s(t)$ .

ii. When does the object stop?

(b) Let  $a(t) = -12t$ ,  $v(0) = 6$  and  $s(0) = 0$ .

i. Find  $v(t)$  and  $s(t)$ .

ii. When does the object stop?

iii. What is the position of the object when it stops?

9. Find the area between the functions  $y = x^2$  and  $y = 4$ .  
10. Find the area between the functions  $y = x^2$  and  $y = x + 1$ .  
11. Find the area between the functions  $y = e^{3x}$ ,  $y = 4$  and the  $y$ -axis.  
12. Find the area between the functions  $x = y^2$  and  $x = 4$ .  
13. Find the area between the functions  $x = y^2$  and  $y = x - 1$ .

14. Find the area between the functions  $y = \ln(x)$ ,  $x = 1$  and  $y = 4$ .
15. Find the area between the functions  $y = \ln(x)$ ,  $x = 3$  and the  $x$ -axis.
16. Find the volume of the solid formed when rotating the region bounded by  $y = x^2$  and  $y = 4$  around the  $x$ -axis using discs.
17. Find the volume of the solid formed when rotating the region bounded by  $y = x^2$  and  $y = 4$  in the first quadrant around the  $y$ -axis using discs.
18. Find the volume of the solid formed when rotating the region bounded by  $y = e^{3x}$ ,  $y = 4$  and the  $y$ -axis around the  $x$ -axis using discs.
19. Find the volume of the solid formed when rotating the region bounded by  $y = x^2$  and  $y = 4$  around the  $x$ -axis using shells.
20. Find the volume of the solid formed when rotating the region bounded by  $y = x^2$  and  $y = 4x$  around the  $y$ -axis using shells.
21. Rotate the region bounded by  $y = 3x$ ,  $y = 4$  and the  $y$ -axis around the  $y$ -axis using discs.
  - (a) Set up the integral with discs and with shells.
  - (b) Compute both of the integrals and compare.
22. Rotate the region bounded by  $y = e^{3x}$ ,  $y = 4$  and the  $y$ -axis around the  $y$ -axis using discs.
  - (a) Set up the integral with discs and with shells.
  - (b) Compute one of the integrals.
23. Rotate the region bounded by the ellipse  $x^2 + \frac{y^2}{4} = 1$ ,  $y = 2x - 2$  around the  $x$ -axis using discs.
  - (a) Set up the integral with discs and with shells.
  - (b) Compute both of the integrals and compare.
24. ~~Compute the following integrals using by parts.~~
  - (a)  ~~$\int x e^{2x} dx$~~
  - (b)  ~~$\int x^2 e^{3x} dx$~~
  - (c)  ~~$\int x^3 e^{3x^2} dx$~~
  - (d)  ~~$\int x \sin(2x) dx$~~

- (e)  $\int x^2 \sin(2x) dx$
- (f)  $\int \ln(x) dx$
- (g)  $\int x \ln(x) dx$
- (h)  $\int x^3 \ln(x) dx$
- (i)  $\int \arctan(2x) dx$

25. Compute the following integrals using u-sub.

- (a)  $\int x e^{x^2} dx$
- (b)  $\int x \sec^2(x^2) dx$
- (c)  $\int (x^2 + 2) e^{x^3 + 6x} dx$
- (d)  $\int x \sqrt{x-1} dx$
- (e)  $\int x \sqrt{x^2 - 1} dx$
- (f)  $\int \frac{3x}{1+x^2} dx$
- (g)  $\int \frac{4}{1+x^2} dx$
- (h)  $\int \sec^2(x) \sin(\tan(x)) dx$
- (i)  $\int e^{2x} \sec(e^{2x}) \tan(e^{2x}) dx$
- (j)  $\int \tan(x) dx$ . Hint use  $\tan(x) = \frac{\sin(x)}{\cos(x)}$  and u-sub.
- (k)  $\int \cot(x) dx$
- (l)  $\int \frac{e^x}{1+e^{2x}} dx$
- (m)  $\int \frac{e^{2x}}{1+e^{2x}} dx$