Exam 2

TMath 125

Winter 2022

Show all your work.

Reasonable supporting work must be shown to earn credit.

1. [4] (ActivityTrigSub #1) One problem required a substitution of  $x = 3\sin(\theta)$ . Find the following in terms of x.

(a)  $\csc(\theta)$ 

(b)  $\cos(\theta)$ 

2. Each of the following is wrong. Explain why.

(a) [2] (Quiz5#1) 
$$\int u \, dv = uv - v \, du$$

(b) [2] (WebHW7-3#1) 
$$\int_{1}^{2} \frac{4}{\sqrt{4+x^{2}}} dx = \int_{1}^{2} \frac{8 \sec^{2}(\theta)}{\sqrt{4+(2 \tan(\theta))^{2}}} d\theta$$
 where  $x = 2 \tan(\theta)$ .

(c) [2] (WrittenHW7-2#4) 
$$\int_0^{\frac{\pi}{4}} \sin^5(x) \, dx = \int_0^{\frac{\sqrt{2}}{2}} u^5 \, du$$
 where  $u = \sin(x)$ .

(d) [2] (ActivityVolume) The region bounded by  $y = \frac{1}{2}x^3$ , y = 4, and x = 0 when revolved around the *y*-axis has volume equal to  $\int_0^2 \pi (\sqrt[3]{2y})^2 dy$ 

- 3. A particle is moving along a straight line with velocity  $v(t) = \sin(\frac{x}{\pi})\cos(\frac{x}{\pi})$  measured in meters per second.
  - (a) [4] (WebHW7-2#9) Find the position function of the particle if we know at time 0, the position is 0.

- (b) [3] (WordProblem2#1) Find the instantaneous acceleration of the particle after one minute.
- 4. Let g be the line graphed below on the right. Let f be a function that is continuous and twice differentiable to continuous functions. Assume that we also have the following values for f and f'.



(d) [4] (practiceExam2 #4) Evaluate 
$$\int_0^4 g(x) f'(x) dx$$

5. For each of the following, identify the technique you would use to find the indefinite integral. For example, if you think substitution would work, write "substitution" and identify what u would be. If you think integration by parts, write "integration by parts" and identify what u and dv would be.

(a) [2] 
$$\int \cos^5(t) \, dt$$

(b) [2]

$$\int y\sqrt{y-4}\,dy$$

- (c) [2]  $\int x \sin(x) \, dx$
- 6. [4] Evaluate one of the indefinite integrals above.

- 7. (WebHW7-2) Consider the curves  $f(x) = \cos^2(x)$ ,  $g(x) = \cos^3(x)$  graphed below.
  - (a) [2] Identify which graph is f and which is g. Justify your answer. 73 0  $\pi/3$   $2\pi/3$   $\pi$   $4\pi/3$   $5\pi/3$   $2\pi$
  - (b) [2] Set up the definite integral that would evaluate the area bounded by f, g, and the vertical lines x = 0 and  $x = 2\pi$ . Do not compute this!!
- 8. (SuggestedWrittenHW6-2#69) Define an object, S, with a triangular base in the xy plane with vertices (0,0), (2,0), and (0,1). The cross-sections of S perpendicular to the y-axis form squares.

| (a) [2] Sketch the base of the object $S$<br>on the $xy$ plane to the right.  | y |     |
|---|---|-----|
| <ul> <li>(b) [2] Recall that the volume can be calculated by taking limits of approximating slices/sections/cylinders/shapes. Draw such an approximating slice/section/cylinder/shape that you can use to find the volume of S. Be</li> </ul> | 1 |     |
| sure to include the $x, y$ , and $z$ axis. 1  | 0 | x 2 |

(c) [3] Set up the definite integral that would find the volume of S. Do *not* compute this!!