

Show all your work.

Reasonable supporting work must be shown to earn credit.

1. [4] (ActivityTrigSub #1) One problem required a substitution of $2x = 3 \tan(\theta)$. Find the following in terms of x (and no trigonometric functions!).

(a) $\cot(\theta)$

(b) $\cos(\theta)$

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

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

(b) [2]
$$\int_2^4 \frac{4}{\sqrt{x^2 - 4}} \, dx = \int_0^{\frac{\pi}{3}} \frac{4}{\sqrt{(2 \sec(\theta))^2 - 4}} \, d\theta \text{ where } x = 2 \sec(\theta).$$

(c) [2]
$$\int_0^{\frac{\pi}{4}} \sin^5(x) \, dx = - \int_0^{\frac{\pi}{4}} (1 - u^2)^2 \, du \text{ where } u = \cos(x).$$

(d) [2] 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 $v(t) = \sin\left(\frac{t}{2\pi}\right) \cos\left(\frac{t}{2\pi}\right)$ measured in meters per second.

(a) [4] Find the position function of the particle given at time 0, the position is 0.

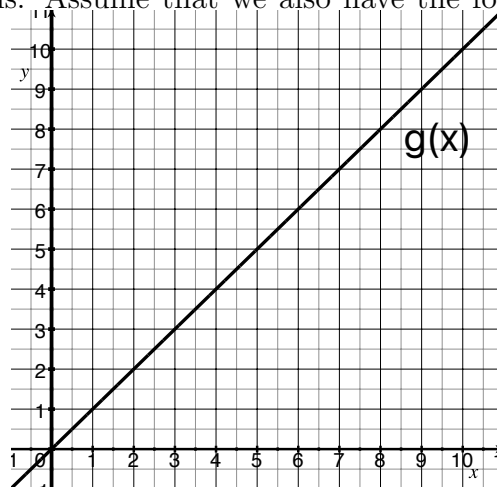
(b) [3] Find the instantaneous acceleration of the particle after one minute.

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' .

| x | $f(x)$ | $f'(x)$ |
|-----|--------|---------|
| 0 | 2 | 3 |
| 4 | 7 | 5 |

(a) [1] Find $f'(4)$.

(b) [2] Find $g'(4)$.



(c) [3] Evaluate $\int_4^0 f'(x) dx$

(d) [4] Evaluate $\int_0^4 2g(x)f''(x) dx$

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]

$$\int \cos^3(t) dt$$

(b) [2]

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

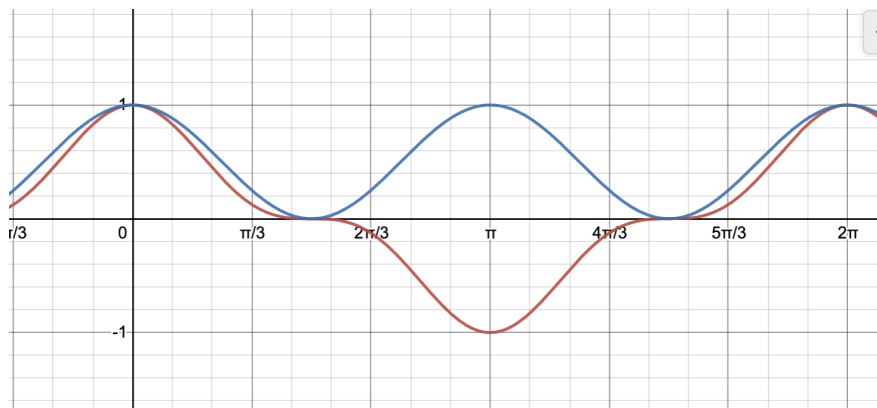
(c) [2]

$$\int x \ln(x) dx$$

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.

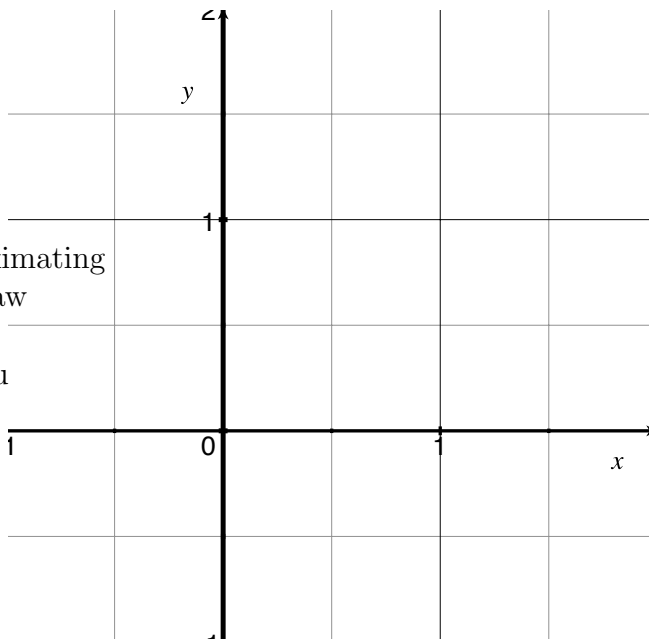
- (a) [2] Identify which graph is f and which is g . Justify your answer.



- (b) [2] Set up the definite integral that would evaluate the area bounded by f , g , and the vertical lines $x = 0$ and $x = \pi$. Do *not* compute this!!

8. (SuggestedWrittenHW6-2#69) Define an object, S , with a triangular base in the xy plane with vertices $(0, 0)$, $(1, 0)$, and $(0, 2)$. The cross-sections of S perpendicular to the x -axis form squares.

- (a) [2] Sketch the base of the object S on the xy plane to the right.



- (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 sure to include the x , y , and z axis.

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