Name ____ Test 3, Spring 2022

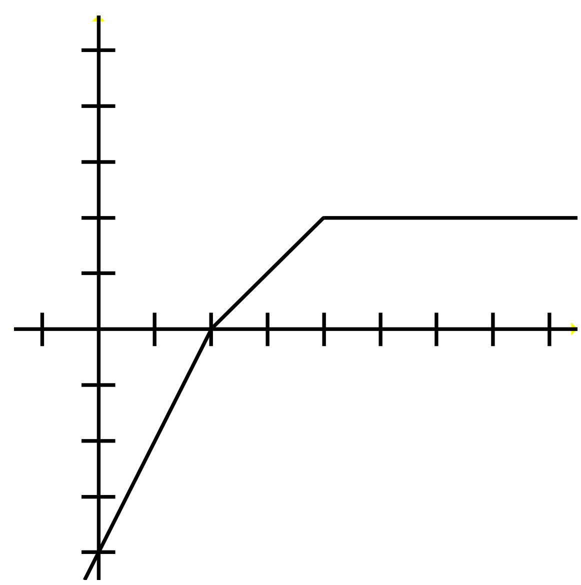
Part 1: Computational Skills

1) Evaluate. (5 points)

$$\sum_{j=2}^{5} 2j$$

Answer: [ ]

2) Given the graph below, find $\int_0^6 f(x)dx$. (5 points)



Answer: [ ]

3) Evaluate. (5 points)

$$\int 2x(x^2 + 4)^3 dx$$

Answer:

4) Evaluate. (5 points)

$$\int \frac{1}{2x + 4} dx$$

Answer:

5) Evaluate. (5 points)

$$\frac{d}{dt}\int_0^t \frac{x^4 + 5x}{x^2 - 3}\,dx$$

Answer:

6) Evaluate. (5 points)

$$\int xe^{x^2}\,dx$$

Answer:

7) Evaluate. (5 points)
(Hint: $25^2 - 22 \cdot 25 - 75 = 0$)

$$\lim_{x \to 25} \frac{x^2 - 22x - 75}{\sqrt{x} - 5}$$

Answer:

8) Set up, but do not evaluate the integral for: (5 points)

The area between $y = \sin(x)$ and $y = \cos(x)$ between $x = 0$ and $x = \frac{\pi}{4}$

Answer:

9) Set up, but do not evaluate the integral for: (5 points)

The volume of the region bounded by the curves below, rotated around the x-axis.

$y = 9 - x^2$
The x-axis
The y-axis

Answer:

10) Set up, but do not evaluate the integral for: (5 points)

The volume of the region bounded by the curves below, rotated around the x-axis.

$y = x + 12$
$y = 6$
$x = 0$
$x = 8$

Answer:

Part 2: Conceptual Understanding

11) Find the integral below. Show your work.
(14 points)

$$\int_0^1 (x+1)(x^2+2x)^2\,dx$$

12) Given the information below, find the integrals that follow. (6 points)

$$\int_0^5 f(x)dx = 10$$
$$\int_0^5 g(x)dx = 25$$
$$\int_0^2 g(x)\,dx = 1$$

$A)\ \int_5^0 f(x)dx$

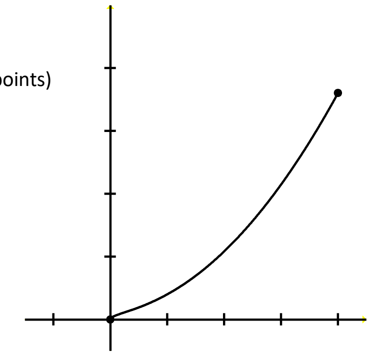
$B)\ \int_2^2 3g(x) + 2f(x)dx$

$C)\ \int_2^5 g(x)dx$

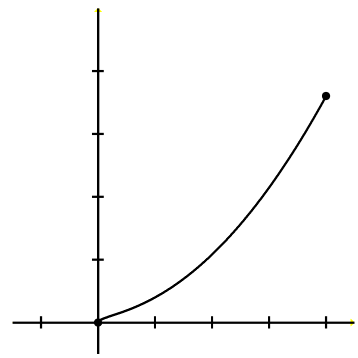
$D)\ \int_0^5 g(x) - 2f(x)dx$

13) Answer each of the following parts.

(A) Illustrate (do not calculate) the area under the curve given below. (2 points)



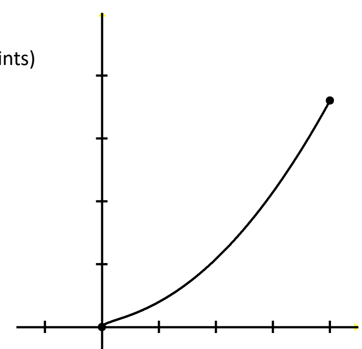
(B) Illustrate (do not calculate) an approximation to the area under the curve given below. (2 points)



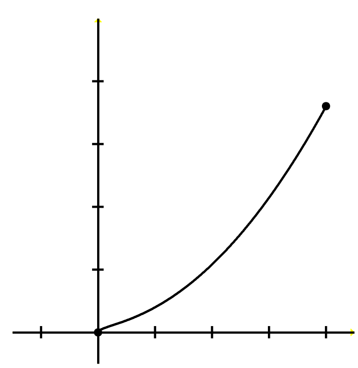
(C) Calculate the approximation you illustrated in part B. (2 points)

(D) Is your approximation in Part C an overestimate or an underestimate? (1 point)

(E) Illustrate a better approximation than you came up with in part B. (2 points)



(F) Illustrate an even better approximation than you came up with in part E. (1 points)



Part 3: Applications

14) Let $g(s)$ be a velocity function. Consider the function below and answer the following parts. (6 points)

$$f(t) = \int_0^t g(s)ds$$

(A) Which one best describe $f(t)$?

I. Position
II. Velocity
III. Acceleration

(B) If $g(s)$ is positive, which one best describes $f(t)$?

I. Positive
II. Negative
III. We cannot know

(C) If $g(s)$ is positive, which one best describes $f(t)$?

I. Increasing
II. Decreasing
III. We cannot know

15) Consider the 3D figure you've been given. Construct it as a solid of revolution by giving equations to create the 2D region and an axis of rotation: (4 points)

It doesn't have to be perfect, as long as your region and axis give the key features.

It is the region bounded by:

______________________________,

______________________________, and

____

Rotated around the axis: ____________________

Part 4: Review

16) Find the derivative of the function below. (5 points)

$$f(x) = \sec(3x^2)$$

Answer:

17) Find the critical values of the function below. (5 points)

$$f(x) = x^3 - 12x$$

Answer: