

Name: _____

Clear your desk of everything excepts pens, pencils and erasers. If you have a question raise your hand and I will come to you.

1. (1 point) **Fill-in-the-Blank.** No work needed. No partial credit available. The indefinite integral

$$\int [x^2(\sqrt{x} - 7) + \sec^2(x)] dx$$

is _____.

2. (1 point) **Fill-in-the-Blank.** No work needed. No partial credit available. The definite integral

$$\int_2^3 [x^2(\sqrt{x} - 7) + \sec^2(x)] dx$$

is _____.

(You do not need to simplify your answer to the second question.)

Extra Work Space.

$$\begin{aligned} \textcircled{1} \int [x^2(\sqrt{x} - 7) + \sec^2 x] dx &= \int [x^{5/2} - 7x^2 + \sec^2 x] dx \\ &= \frac{2}{7} x^{7/2} - \frac{7}{3} x^3 + \tan x + C \end{aligned}$$

$$\begin{aligned} \textcircled{2} \int_2^3 [x^2(\sqrt{x} - 7) + \sec^2 x] dx &= \left[\frac{2}{7} x^{7/2} - \frac{7}{3} x^3 + \tan x \right]_2^3 \\ &= \frac{2}{7} (3^{7/2} - 2^{7/2}) - \frac{7}{3} (27 - 8) + (\tan 3 - \tan 2) \end{aligned}$$

3. An object moves along a line with velocity $v(t) = \sqrt{t} - 1$, starting from a position 3 units to the right of the origin at time $t = 0$ s.
- (a) (1 point) What is the position of the object at time $t = 4$ s?
- (b) (2 points) What is the total distance traveled by the object over the time interval $0 \leq t \leq 4$?

$$\textcircled{a} \quad v(4) - v(0) = \int_0^4 (\sqrt{t} - 1) dt$$

$$v(4) - 3 = \left[\frac{2}{3} t^{3/2} - t \right]_0^4$$

$$v(4) - 3 = \left[\frac{2}{3}(8) - 4 \right] - 0$$

$$v(4) - 3 = \frac{4}{3}$$

$$v(4) = \frac{13}{3}$$

\textcircled{b} Note $v(t)$ is negative on $[0, 1]$, positive on $[1, 4]$.

$$\int_0^4 |v(t)| dt = \int_0^1 (1 - \sqrt{t}) dt + \int_1^4 (\sqrt{t} - 1) dt$$

$$= \left[t - \frac{2}{3} t^{3/2} \right]_0^1 + \left[\frac{2}{3} t^{3/2} - t \right]_1^4$$

$$= \left[\left(1 - \frac{2}{3}\right) - 0 \right] + \left[\left(\frac{2}{3}(8) - 4\right) - \left(\frac{2}{3} - 1\right) \right]$$

$$= \frac{1}{3} + \frac{4}{3} + \frac{1}{3}$$

$$= \frac{6}{3}$$

$$= 2 \text{ units.}$$