Chapter 5 Test   November 4, 2016   Name

1. Citizens of the United States will be voting to elect a new president on November 8. Santa Clara County Election officials are hoping to count the votes quickly. Using the table below, approximate the number of votes counted in the first 16 hours since the polls opened. Make use of a trapezoidal approximation method.

Time	7 am	9 am	11 am	1 pm	3 pm	5 pm	8 pm	11 pm
Rate $\left(\frac{\text{thousands of ballots}}{\text{hour}}\right)$	0	14	22	31	35	42	44	38

2. Find the total area trapped between the two functions $y = 0$ and $y = (2 - x)x$ on the interval $[-1, 3]$.

3. Evaluate $\displaystyle\int_{-4}^{2} (6 - |x - 1|)\,dx$

4. Find $f\left(\frac{-\pi}{6}\right)$ if $\displaystyle\int_{x}^{\frac{-\pi}{3}} f(t)\,dt = (\cot(2x))^2$

5. Write the following expression as a definite integral, <u>but</u> <u>do</u> <u>not</u> <u>evaluate</u> <u>the</u> <u>resulting</u> <u>integral</u>:

$$\lim_{n \to \infty} \sum_{k=1}^{n} \left(2\left(-2 + \frac{3k}{n}\right)^2 + 3\left(-4 + \frac{6k}{n}\right)\right)\left(\frac{4}{n}\right)$$

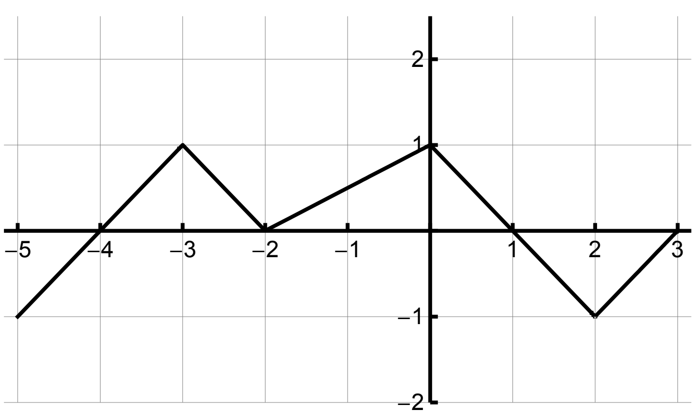
6. Use Simpson's Rule with $n = 4$ to approximate the value of $\int_{\frac{-2\pi}{3}}^{\frac{2\pi}{3}} \left(\sec\left(\frac{x}{2}\right)\right) dx$ (simplify your answer).

7. Evaluate $\int_{0}^{-1} \left(\frac{d}{dx}\left(\cot^{-1}\left(x^2\right)\right)\right) dx$

8. The curve below, $f(t)$, represents the <u>velocity</u> of a particle on a coordinate axis, measured in $\frac{\text{feet}}{\text{second}}$

If the position of the particle is $s(t) = \int_{-2}^{t} v(x)\,dx$ feet, defined on $[-5, 3]$, answer the following

(a) graph the position function, $s(t)$, and the acceleration function, $a(t)$, on the same coordinate axes
(b) Find the minimum position for this particle, and where it occurs
(c) Find the interval (s) where the acceleration is negative
(d) Find $s(3)$ and $s(-5)$



9. Consider the function $f(x) = 2 - \sqrt{16 - x^2}$ Find the average value of this function on $[-4, 0]$.

10. Suppose $f(x) = x^2 + 4x + 4$ and P is the partition of $[-6, 3]$ into the five subintervals determined by $x_0 = -6$, $x_1 = -4$, $x_2 = -3$, $x_3 = -1$, $x_4 = 1$, and $x_5 = 3$. Draw the rectangles for the Riemann sum R_p, and evaluate, if $c_1 = -5$, $c_2 = -3$, $c_3 = -2$, $c_4 = 0$, and $c_5 = 3$.

11. Find the linearization formula for $f(x) = 4 - \int_{\frac{x}{2}}^{\frac{\pi}{3}} \cos(3t)\,dt$ at $x = \frac{2\pi}{3}$

12. Evaluate $\int_{-3}^{3} \frac{|4x + 4|}{x + 1}\, dx$

13. Use both definitions of the definite integral to set up limits that would represent the area "underneath the curve" of $y = \sin\left(\frac{x}{3}\right)$ on the interval $\left[\frac{-\pi}{6}, \frac{7\pi}{6}\right]$. These have been started for you below. (do not evaluate the limits)

(i) $\int_{\frac{-\pi}{6}}^{\frac{7\pi}{6}} \sin\left(\frac{x}{3}\right) dx = \lim \sum$

(ii) $\int_{\frac{-\pi}{6}}^{\frac{7\pi}{6}} \sin\left(\frac{x}{3}\right) dx = \lim \sum$

14. Find all x – values where local extreme values exist for the function $f(x) = \int_{x}^{3} \left(6t^2 + 7t - 3\right) dt$

Be sure to identify these values as max or min.