MATH 161: A COLLECTION OF PRACTICE EXERCISES DRAWN FROM OLD QUIZZES

NOVEMBER 2019

1. Find the area between the two curves: $y = 4x^2 + 10x + 13$ and $y = 11 - 4x^2$. Sketch.

2. Let $F(x) = \sin x + \int_{-3}^{\cos x} \frac{1}{5+t^3}\,dt$. *Find* $F'(x)$.

3. Using the FTC, find the area beneath the curve $f(x) = \frac{x^6}{5+3x^7}$ that is above the interval [0, 1].

4. Let C(t) be the temperature, in degrees Fahrenheit, of a warm can of soda t minutes after it was put in a refrigerator. Suppose C(10) = 62.

a. Assuming C has an inverse, give a practical interpretation of the statement $C^{-1}(45) = 40$

b. Give a practical interpretation of the statement. $C'(10) = -0.4$

c. Give a practical interpretation of the statement $\int_0^{10} C'(t)dt = -5$

d. Assuming the statements in parts (a)-(c) are true, determine C(0).

e. What is the practical meaning of: $\int_0^1 C(t)dt$?

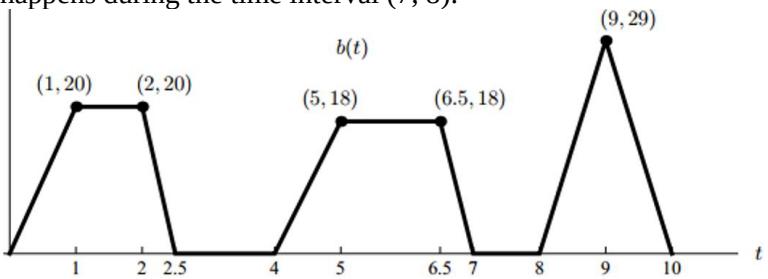
5. **Extra Credit**: Suppose $\int_0^{2x+1} f(t)\ dt = x\sqrt{5x+9}$. Find $f(1)$

6. Evaluate each of the following Riemann integrals. Show your work!

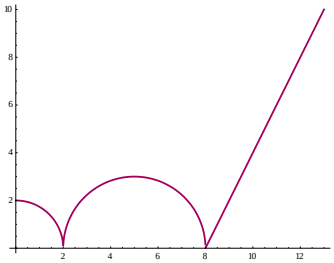
(a) $\int_{-5}^{5} \frac{x^5}{1+3\cos(9x)}\,dx$ (b) $\int_0^5 \sqrt{25-x^2}\,dx$ (c) $\int_{-5}^{5} |x-3|\,dx$

7. Below is the graph of the *velocity* of Marcel, a sleepwalker. At time t = 0, Marcel is in his bed and suddenly awakens. (Assume that the units are feet and minutes.)

(a) How far is Marcel from his bed at time t = 10?
(b) When is his speed the greatest?
(c) Explain what happens during the time interval (7, 8).

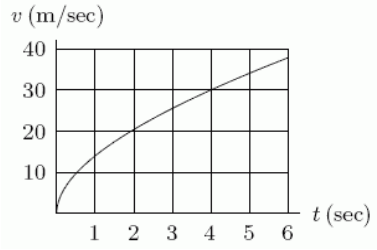


8. Below is the graph of the *velocity*, in feet per second, $0 \le t \le 13$, of a frightened skunk as it tries to run away from a German Shepard. From t = 0 to t = 2, we have a quarter of a circle; from t = 2 to t = 8, we have a semicircle; from t = 8 until t = 13, we have a straight line segment. *[Note that this is the graph of velocity, not distance.]*



What is the *total distance* traveled by the skunk between t = 0 and t = 13? Give an *exact* answer!

9. The figure below shows the graph of the velocity, *v*, of an object (in meters/sec.). If the graph were shifted up 4 units, how would the total distance traveled between *t* = 0 and *t* = 6 change?

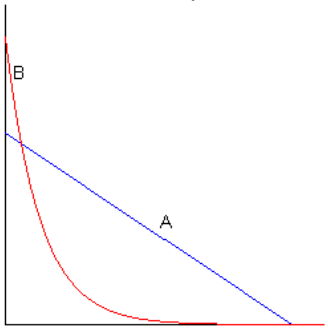


A) It would increase by 4 units.
B) It would increase by 24 units.
C) It would remain the same.
D) It would decrease by 4 units.
E) It would decrease by 24 units.

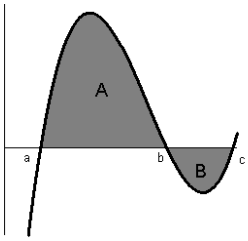
10. At time *t*, in seconds, your velocity *v*, in meters/sec, is given by $v(t) = 9 + 4t^2$ for $0 \le t \le 6$. Which is more accurate?

A) An estimate of the distance traveled during this time using $\Delta t = 1$.
B) An estimate of the distance traveled during this time using $\Delta 7$.

11. Two greyhound racing dogs, A and B, start at the same time and travel in the same direction along a straight track. The figure below gives the velocity, *v*, of each dog as a function of time *t*. Which dog travels the farthest? *Explain!*



12. What is the value of the Riemann integral, $\int_a^c f(x)dx$, if the area of A = 15 and the area of B = 4?

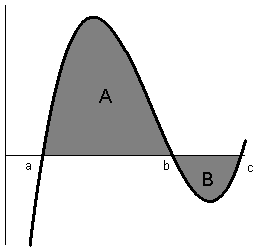


A) 5.5 B) 22 C) –11 D) 11 E) 19

13. Evaluate the following Riemann integral:

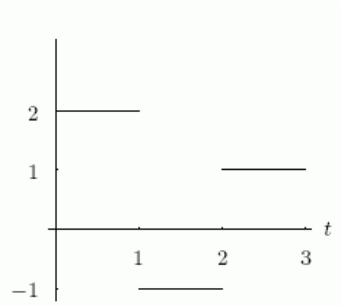
$$\int_0^{\frac{\pi}{3}} \frac{\cos 3x}{1+(\sin 3x)^2}\,dx$$

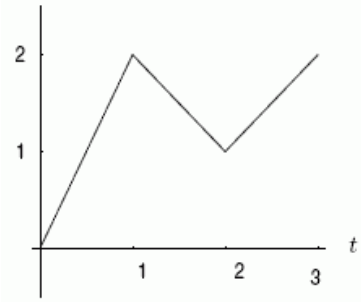
What is the value of $\int_a^c |f(x)|\,dx$ if the area of A = 9 and the area of B = 2?



A) 3.5 B) 14 C) –7 D) 7 E) 11

14. The velocity and acceleration of an object are given by the graphs shown below, where v(0) = 0. . Which graph shows acceleration?

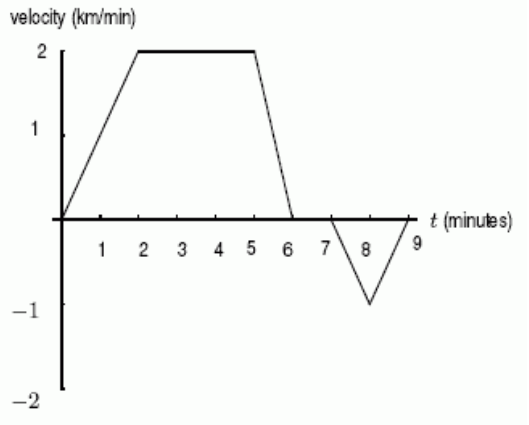




A) The one on the left. B) The one on the right.

15. A car is moving along a straight road from *A* to *B*, starting from *A* at time $t = 0$. Below is the velocity (positive direction is from *A* to *B*) plotted against time.

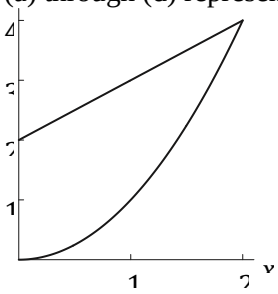
How many kilometers away from *A* is the car at time $t = 9$? *Explain!*

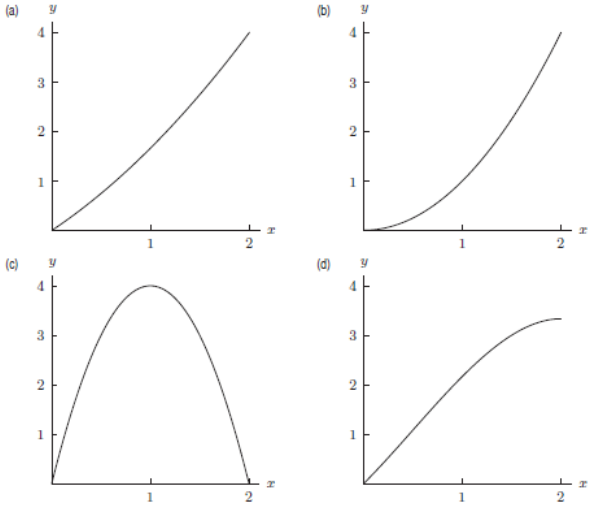


16. Find the area of the region bounded by the line $y = x$ and the parabola $y = 5x - x^2$. Sketch!

17. Find the value of *c* so that the area enclosed by the parabolas $y = x^2 - c^2$ and $y = x^2 + c^2$ is 576. Sketch!

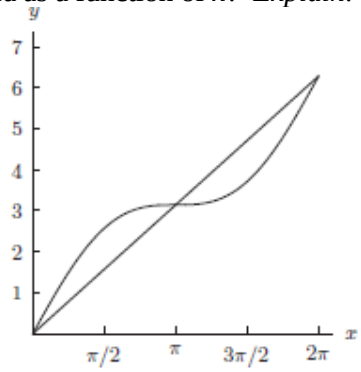
18. Consider the area between the two functions shown in figure below. Which of the following graphs (a) through (d) represents this area as a function of x?

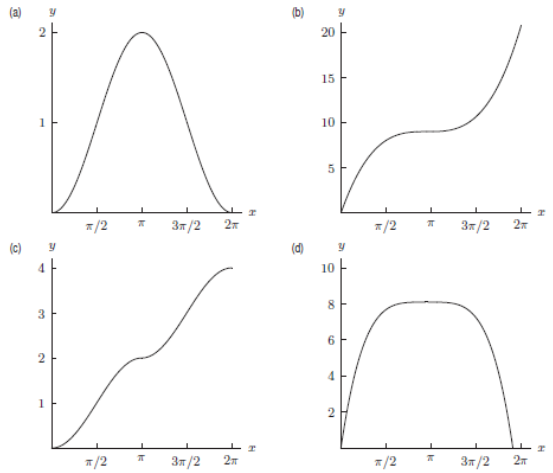




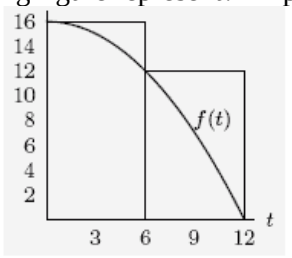
19. Given that $F(x)=\int_0^x \sqrt{\dfrac{1+2\cos t}{3+4e^{5t}}}\,dt$. Compute F′(0).

20. Consider the area between the two functions shown in the figure below. Which of the following graphs (a)–(d) represents this area as a function of x? *Explain!*





21. What does the following figure represent? Explain briefly.



A) The right-hand Riemann sum for the function f on the interval $0 \le t \le 12$ with $\Delta t = 3$.

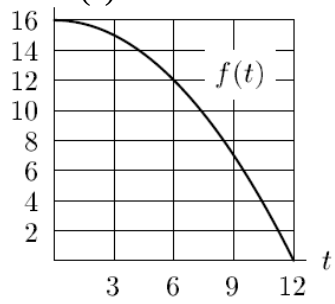
B) The right-hand Riemann sum for the function f on the interval $0 \le t \le 12$ with $\Delta t = 6$.

C) The left-hand Riemann sum for the function f on the interval $0 \le t \le 12$ with $\Delta t = 3$.

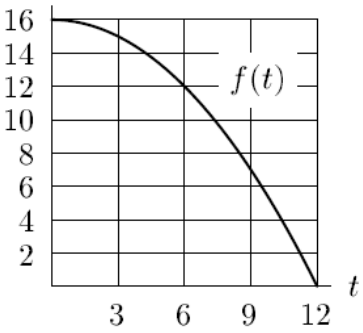
D) The left-hand Riemann sum for the function f on the interval $0 \le t \le 12$ with $\Delta t = 6$.

22. Using the given graphs, draw rectangles representing each of the following Riemann sums for the function on the interval [0, 12]. *Calculate the value of each Riemann sum.* (You may leave your answer in non-simplified form if you have no time to perform the addition.)

(a) Left-hand sum with $\Delta t = 3$.



(b) Right-hand sum with $\Delta t = 3$.



23. Suppose that $\int_2^7 (3f(x)-1)dx = a$ and $\int_7^9 (4g(x)-1)dx = 4$

Find $\int_2^9 (f(x)-g(x))dx$