Math 251: Quiz 9 SOLUTIONS **November 27, 2018**

Name: ____________________ __________ **/ 25**

Instructor: **Bueler | Jurkowski | Maxwell**

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. Show all work for full credit.

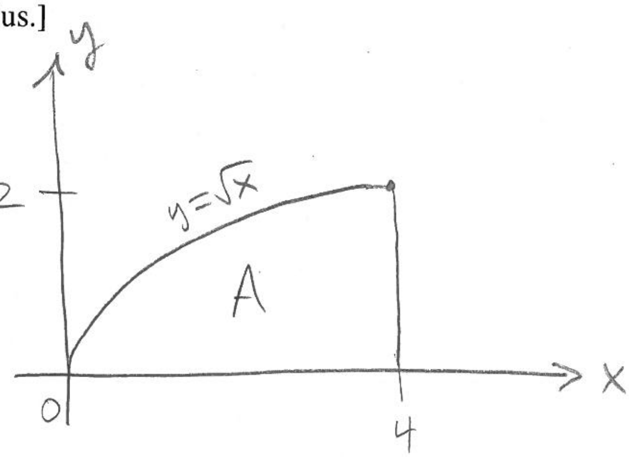
1. [5 points] Sketch the region enclosed by the given curves and calculate its area. [You may use either part of the Fundamental Theorem of Calculus.]

$y=\sqrt{x}, \quad y=0, \quad x=4$

$$A = \int_0^4 \sqrt{x}\,dx$$

$$= F(4)-F(0) = \frac{2}{3}\cdot 4^{3/2} - 0 = \frac{16}{3}$$

$$F(x) = \frac{x^{3/2}}{3/2} = \frac{2}{3}x^{3/2}$$



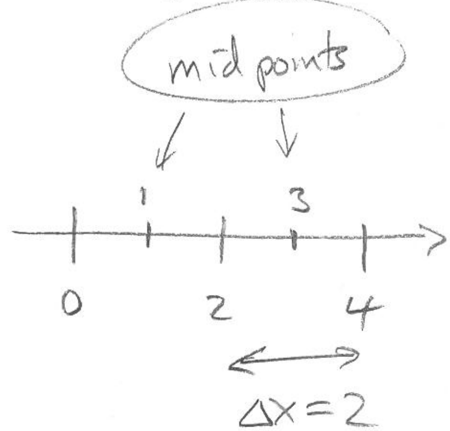
2. [5 points] Use the Midpoint Rule with $n=2$ subintervals to approximate the integral:

$$\int_0^4 \frac{x}{x+1}\,dx \approx f(1)\cdot 2 + f(3)\cdot 2$$

$$= \frac{1}{1+1}\cdot 2 + \frac{3}{3+1}\cdot 2$$

$$= \frac{1}{2}\cdot 2 + \frac{3}{4}\cdot 2 = 1+\frac{3}{2}$$

$$= \frac{5}{2}$$



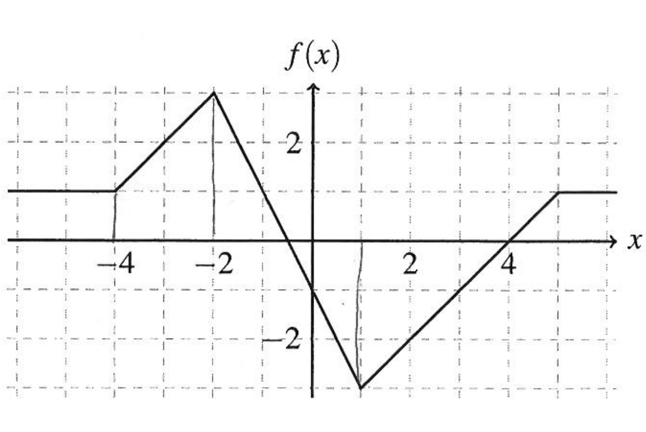
3. [3 points] The graph of f is shown. Evaluate each integral by interpreting it in terms of areas.

a. $\int_{-4}^{-2} f(x)\,dx = 4$

b. $\int_{-4}^{1} f(x)\,dx = 4$

c. $\int_{4}^{1} f(x)\,dx = -\int_1^4 f(x)\,dx$

$$= -\left(-\frac{9}{2}\right) = \frac{9}{2}$$



4. [4 points] Evaluate the integral.

$$\int_1^3 (x-2)(x+4)\,dx = \int_1^3 x^2+2x-8\,dx$$

$$= F(3) - F(1) = \left(\frac{27}{3} + 9 - 24\right) - \left(\frac{1}{3} + 1 - 8\right)$$

$$F(x) = \frac{x^3}{3} + x^2 - 8x \qquad = -6 - \frac{1}{3} + 7 = \frac{2}{3}$$

5. [4 points] Evaluate the integral.

$$\int_0^1 (e + x^e + e^x)\,dx = F(1) - F(0) = \left(e + \frac{1}{e+1} + e\right) - (0+0+1)$$

$$F(x) = ex + \frac{x^{e+1}}{e+1} + e^x \qquad = 2e + \frac{1}{e+1} - 1$$

6. [4 points] Let $F(x) = \int_2^x e^{t^2}\,dt$. Find an equation of the tangent line to the curve $y = F(x)$ at the point where $x = 2$.

by FTC I: $F'(x) = e^{x^2}$

so: $F'(2) = e^4$

also: $F(2) = \int_2^2 e^{t^2}\,dt = 0$

so $y - y_0 = m(x - x_0)$: $y - 0 = e^4(x-2)$

$$y = e^4(x-2)$$