Circle your Instructor:
Faudree, Williams, Zirbes

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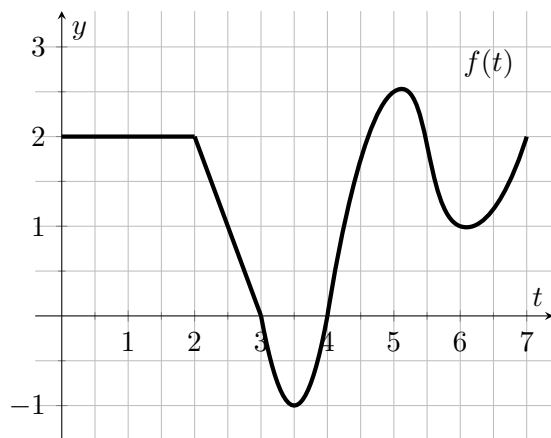**Math 251 Fall 2017**   **Quiz #11, November 29th**

Name: _____ Solutions _____

There are 25 points possible on this quiz. This is a closed book quiz. Calculators and notes are not allowed. **Please show all of your work!** If you have any questions, please raise your hand.

Exercise 1. (3 pts.) Let $g(x) = \int_0^x f(t)dt$ where the graph of $y = f(t)$ is displayed below.

(a) Find $g(3) = 2 \cdot 2 + \frac{1}{2} \cdot 2 \cdot 1 = 5$

(b) In the open interval $(0, 7)$, when does $g(x)$ have a maximum?

$x = 3$

(c) When is $g(x)$ increasing?

$(0, 3) \cup (4, 7)$

Exercise 2. (5 pts.) Find the derivative of the function.

(a) $g(x) = \int_x^1 \cos t \, dt$

$g'(x) = -\cos(x)$

(b) $F(x) = \int_0^{x^3} \sqrt{1 + t^4} \, dt$

$F'(x) = 3x^2 \sqrt{1 + x^{12}}$

Exercise 3. (3 pts.) What, if anything, is wrong with the following calculation?

$$\int_0^5 \frac{1}{x - 2} dx = \ln|x - 2| \Big|_0^5 = \ln 3 - \ln 2$$

$\frac{1}{x-2}$ is not continuous on $[0, 5]$ so the FTC doesn't apply.

Exercise 4. (6 pts.) Evaluate the following integrals.

(a) $\int_0^{\pi/4} (\sec^2 t - 2e^t)\, dt$

$= \tan t - 2e^t \Big|_0^{\pi/4}$

$= 1 - 2e^{\pi/4} - (0 - 2)$

$= 3 - 2e^{\pi/4}$

(b) $\int_0^1 \frac{4}{\sqrt{1 - x^2}}\, dx$

$= 4 \arcsin(x) \Big|_0^1$

$= 4 \cdot \frac{\pi}{2} - 4 \cdot 0 = 2\pi$

Exercise 5. (8 pts.) Evaluate the following integrals.

(a) $\int_0^1 (v^2 + 2)^2\, dv$

$= \int_0^1 v^4 + 4v^2 + 4\, dv$

$= \frac{v^5}{5} + \frac{4}{3}v^3 + 4v \Big|_0^1$

$= \frac{1}{5} + \frac{4}{3} + 4 = \frac{60 + 3 + 20}{15}$

$= \frac{83}{15}$

(b) $\int_1^4 \frac{(4 - t)}{\sqrt{t}}\, dt \quad = \int_1^4 4t^{-1/2} - t^{1/2}\, dt$

$= 8t^{1/2} - \frac{2}{3}t^{3/2} \Big|_1^4 = 16 - \frac{16}{3} - \left(8 - \frac{2}{3}\right)$

$= 8 - \frac{14}{3} = \frac{10}{3}$