Circle your Instructor:
Faudree, Williams, Zirbes

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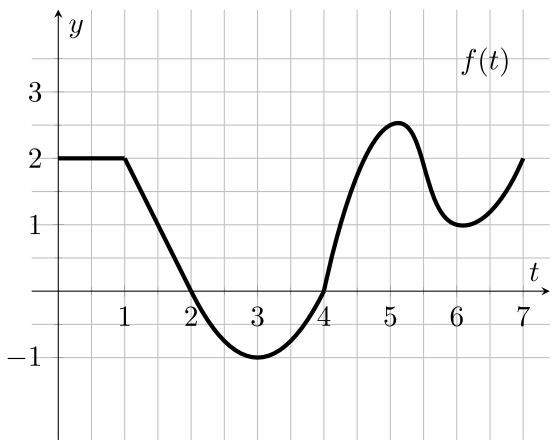
Math 251 Fall 2017 **Quiz #11, November 29th**

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

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

$x = 2$

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

$(0,2) \cup (4,7)$

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

(a) $g(x) = \int_x^2 \sec^2 t dt$ $= -\int_2^x \sec^2 t \, dt$

$\Rightarrow \frac{d}{dx} g(x) = -\sec^2(x)$

(b) $F(x) = \int_0^{x^4} \sqrt{1+t^2}dt$

$F'(x) = \sqrt{1+x^8} \cdot 4x^3$

$= 4x^3\sqrt{1+x^8}$

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

$$\int_0^6 \frac{1}{x-4}dx = \ln|x-4|\Big|_0^6 = \ln 2 - \ln 4 = \ln\left(\frac{2}{4}\right) = \ln\left(\frac{1}{2}\right)$$

$\frac{1}{x-4}$ is not continuous on $[0,6]$, so FTC does not apply.

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

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

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

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

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

(b) $\displaystyle\int_0^1 \frac{3}{\sqrt{1-x^2}}dx = 3\arcsin(x)\Big|_0^1$

$= 3\arcsin(1) - 3\arcsin(0)$

$= 3\cdot\frac{\pi}{2} - 3\cdot 0 = \frac{3\pi}{2}$

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

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

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

$= \frac{v^5}{5} + \frac{2}{3}v^3 + v \Big|_0^1$

$= \frac{1}{5} + \frac{2}{3} + 1 = \frac{3+10+15}{15}$

$= \frac{28}{15}$

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

$= \frac{2}{1/2}t^{1/2} - \frac{2}{3}t^{3/2}\Big|_1^4$

$= 4t^{1/2} - \frac{2}{3}t^{3/2}\Big|_1^4$

$= 8 - \frac{16}{3} - (4 - \frac{2}{3})$

$= 4 - \frac{14}{3} = -\frac{2}{3}$