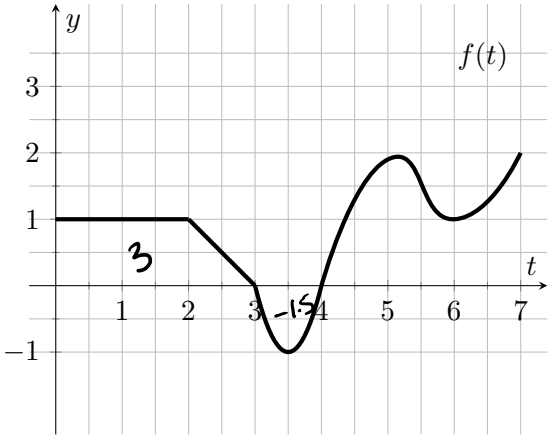
Circle your Instructor:
Faudree, Williams, Zirbes _____ / 25

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

Name: _____

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 $g(3) = \int_0^3 f(t)dt$

$= 2 + 1/2 =$ **2.5**

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

at x=3

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

when $g'(x) = f(x)$ is positive

so on **(0,3) U (4,7)**

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

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

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

(b) $F(x) = \int_0^{x^2} \sqrt{2 + t^3}dt$

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

$F'(x) = 2x\sqrt{2 + x^6}$

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

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

The function $f(x) = \frac{1}{x-3}$ is not continuous on $[0,5]$ and thus the integral does not exist.

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

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

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

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

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

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

$= 2\arcsin 1/2 - 2\arcsin 0$

$= 2(\pi/6)$

$= \boxed{\pi/3}$

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

(a) $\int_0^1 (v^2+3)^2 dv$

$= \int_0^1 (v^4 + 6v^2 + 9)\,dv$

$= \left(\frac{1}{5}v^5 + 2v^3 + 9v\right)\Big|_0^1$

$= \frac{1}{5} + 2 + 9$

$= \frac{1}{5} + \frac{55}{5}$

$= \boxed{\frac{56}{5}}$

(b) $\int_1^9 \frac{(3-t)}{\sqrt{t}}dt = \int_1^9 (3t^{-1/2} - t^{1/2})\,dt$

$= \left(6t^{1/2} - \frac{2}{3}t^{3/2}\right)\Big|_1^9$

$= 18 - \frac{2}{3}(27) - (6 - 2/3)$

$= 18 - 18 - 6 + 2/3$

$= -18/3 + 2/3$

$= \boxed{\frac{-16}{3}}$