**Quiz 2** MAC-2312 Spring 2017 **Name:** Solution Key

**To receive credit you MUST SHOW ALL YOUR WORK.**

**1.** (2 pts) If $h'(t)$ is the rate of change of a child's height measured in inches per year, what does the integral $\int_2^8 h'(t)\,dt$ represent and what are its units?

By FTC, $\int_2^8 h'(t)\,dt = h(8) - h(2)$, so this represents the change in height of the child from age 2 to age 8. Units $\to$ inches

**2.** (3 pts) Is the statement below true or false? Answer (1 pt) and briefly justify your answer (2 pts).

*There does not exist a differentiable function $F(x)$ such that $F'(x) = |x|$.* True **False**

**Justification:** By F.T.C. part (b) since $|x|$ is continuous the function

$F(x) = \int_0^x |t|\,dt$, satisfies $F'(x) = |x|$

(or, shorter said, any continuous function has an anti-derivative! and $y = |x|$ is continuous)

**3.** (6 pts) Evaluate each integral (3 pts each):

(a) $\int_1^4 \frac{1}{x\sqrt{x}}\,dx =$

$= \int_1^4 x^{-\frac{3}{2}}\,dx =$

$= (-2)x^{-\frac{1}{2}}\Big|_{x=1}^{x=4}$

$= -\frac{2}{\sqrt{x}}\Big|_{x=1}^{x=4}$

$= -\frac{2}{\sqrt{4}} + \frac{2}{\sqrt{1}} = \boxed{1}$

(b) $\int_0^{5\pi/6} |\cos x|\,dx$

$=$

$\int_0^{\frac{\pi}{2}} |\cos x|\,dx + \int_{\frac{\pi}{2}}^{\frac{5\pi}{6}} |\cos x|\,dx =$

(in 1st quadrant $\cos x > 0$) (in 2nd quadrant $\cos x < 0$)

$= \int_0^{\frac{\pi}{2}} \cos x\,dx + \int_{\frac{\pi}{2}}^{\frac{5\pi}{6}} (-\cos x)\,dx$

$= (\sin x)\Big|_{x=0}^{x=\frac{\pi}{2}} - \sin x\Big|_{x=\frac{\pi}{2}}^{x=\frac{5\pi}{6}}$

$= \sin\frac{\pi}{2} - \sin 0 - \sin\frac{5\pi}{6} + \sin\frac{\pi}{2}$

$= 1 - 0 - \frac{1}{2} + 1 = \boxed{\frac{3}{2}}$