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MATH 172 EXAM 1 Fall 1998

Section 502 P. Yasskin

Multiple Choice: (4 points each)

**1**. Evaluate $\int_0^2 \sqrt{4 - x^2} + 1 \, dx$ by interpretating it as an area.

**a**. $2 + 2\pi$
**b**. $1 + \pi$
**c**. $1 + 2\pi$
**d**. $\pi - 1$
**e**. $2 + \pi$

**2**. Approximate the area between the curves $y = x$ and $y = 1 + x^2$ for $0 \le x \le 6$ using $3$ rectangles with equal widths and with heights given by the function values at the **left** endpoints.

**a**. $17$
**b**. $29$
**c**. $34$
**d**. $46$
**e**. $58$

**3**. A girl walks(runs) in a straight line with acceleration $a(t) = 4t + \sin t$. If her initial velocity is $v(0) = 3$, find her velocity at $t = 2$.

**a**. $12 - \cos 2$

**b**. $12 + \cos 2$

**c**. $10 - \cos 2$

**d**. $10 + \cos 2$

**e**. $8 + \sin 2$

**4**. Compute: $\int_0^1 x^{3/7}\,dx$

**a**. $-\frac{7}{4}$

**b**. $-\frac{4}{7}$

**c**. $\frac{7}{3}$

**d**. $\frac{3}{7}$

**e**. $\frac{7}{10}$

**5**. Compute: $\int \sqrt{x}\left(x^2 - \frac{1}{x}\right)dx$

**a**. $\frac{2x^{7/2}}{7} + \frac{2x^{-3/2}}{3} + C$

**b**. $\frac{2x^{7/2}}{7} - 2x^{1/2} + C$

**c**. $\frac{2x^{37/2}}{3} + \frac{2x^{-3/2}}{3} + C$

**d**. $\sqrt{x}\left(\frac{x^3}{3} - \ln x\right) + \frac{2x^{3/2}}{3}(x^2 - \ln x) + C$

**e**. $\frac{2x^{3/2}}{3}\left(\frac{x^3}{3} - \ln x\right) + C$

**6**. Compute: $\int_0^2 x\sqrt{4-x^2}\,dx$

**a**. $\frac{2\sqrt{2}}{3}$

**b**. $\frac{8}{3}$

**c**. $24$

**d**. $\frac{32}{3}$

**e**. $6$

**7**. Compute: $\int_0^{1/4} \sin(\pi t)\,dt$

**a**. $\frac{1}{\pi\left(\sqrt{2}-1\right)}$

**b**. $\frac{1}{\pi\left(1-\sqrt{2}\right)}$

**c**. $\frac{1}{\pi\sqrt{2}}-\frac{1}{\pi}$

**d**. $\frac{1}{\pi}-\frac{1}{\pi\sqrt{2}}$

**e**. $-\frac{1}{\pi\sqrt{2}}$

**8**. The mass density of a $3$ cm bar is $\rho = 1 + x^2 \ \frac{\text{gm}}{\text{cm}}$ for $0 \le x \le 3$. Find the total mass of the bar.

**a**. $4$ gm

**b**. $10$ gm

**c**. $12$ gm

**d**. $18$ gm

**e**. $30$ gm

**9**. The mass density of a $3$ cm bar is $\rho = 1 + x^2 \ \frac{\text{gm}}{\text{cm}}$ for $0 \le x \le 3$. Find the average density of the bar.

**a**. $4 \ \frac{\text{gm}}{\text{cm}}$

**b**. $10 \ \frac{\text{gm}}{\text{cm}}$

**c**. $12 \ \frac{\text{gm}}{\text{cm}}$

**d**. $\frac{10}{3} \ \frac{\text{gm}}{\text{cm}}$

**e**. $\frac{13}{4} \ \frac{\text{gm}}{\text{cm}}$

**10**. The mass density of a $3$ cm bar is $\rho = 1 + x^2 \ \frac{\text{gm}}{\text{cm}}$ for $0 \le x \le 3$. Find the $x$-coordinate of the center of mass of the bar.
(If you prefer, you may think of this as a plate of uniform density $\rho = 1$ between $y = 1 + x^2$ and the $x$-axis for $0 \le x \le 3$.)

**a**. $\frac{3}{2}$

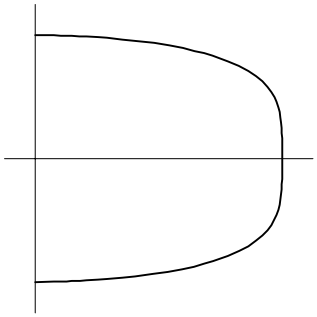
**b**. $2$

**c**. $\frac{7}{3}$

**d**. $\frac{33}{16}$

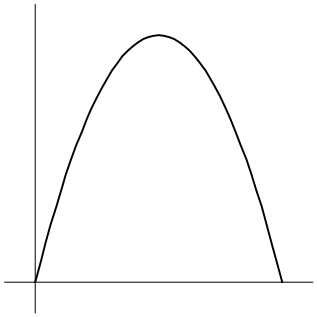
**e**. $\frac{99}{4}$

**11**.



(15 points) The area between the curve $x = \sqrt{16 - y^4}$ and the $y$-axis is rotated about the $y$-axis. Find the volume of the solid swept out.

**12**.

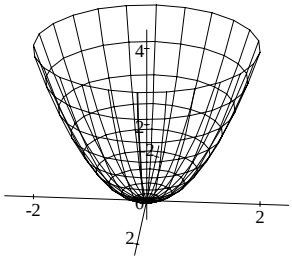


(15 points) The area between the curve $y = 4x - x^2$ and the $x$-axis is rotated about the $y$-axis. Find the volume of the solid swept out.

**13**. (15 points) Find the arc length of the parametric curve $x = \frac{1}{2}t^6, \quad y = t^4$ between $t = 0$ and $t = 1$.

HINT: $\sqrt{t^{2a} + t^{2a+b}} = t^a\sqrt{1 + t^b}$

**14**.




(15 points) A bowl is formed by rotating the curve $y = x^2$ for $0 \leq x \leq 2$ about the $y$-axis. This bowl is full of water. How much work is done in pumping the water out the top of the bowl? Leave the density as $\rho$ and the acceleration of gravity as $g$.