MAT 126 Fall 2020, Quiz 6

Name	ID	Section

THIS QUIZ IS WORTH 10 POINTS.
NO BOOKS, NOTES OR CALCULATORS ARE ALLOWED.

Write the correct answer in the box.

(1) ☐ Which formula gives the surface area obtained by rotating the graph of f for $a \leq x \leq b$ around the x-axis?

(a) $2\pi \int_a^b |f(x)|\sqrt{1+(f'(x))^2}dx$ **(c)** $2\pi \int_a^b \sqrt{1+(f'(x))^2}dx$ **(e)** $2\pi \int_a^b |f'(x)|\sqrt{1+(f(x))^2}dx$
(b) $\pi \int_a^b |f'(x)|\sqrt{1+(f(x))^2}dx$ **(d)** $2\pi \int_a^b x\sqrt{1+(f'(x))^2}dx$ **(f)** none of the above

(2) ☐ What is the surface area obtained by rotating the graph of f on $0 \leq a \leq x \leq b$ around the y-axis?

(a) $2\pi \int_a^b |f(x)|\sqrt{1+(f'(x))^2}dx$ **(c)** $2\pi \int_a^b \sqrt{1+(f'(x))^2}dx$ **(e)** $2\pi \int_a^b x\sqrt{1+(f(x))^2}dx$
(b) $2\pi \int_a^b |f'(x)|\sqrt{1+(f(x))^2}dx$ **(d)** $2\pi \int_a^b x\sqrt{1+(f'(x))^2}dx$ **(f)** none of the above

(3) ☐ Which formula gives the arclength of the graph of f with $a \leq x \leq b$?

(a) $2\pi \int_a^b \sqrt{1+(f'(x))^2}dx$ **(c)** $\int_a^b x\sqrt{1+(f'(x))^2}dx$ **(e)** $\int_a^b |f'(x)|\sqrt{1+(f(x))^2}dx$
(b) $\int_a^b \sqrt{1+(f'(x))^2}dx$ **(d)** $2\pi \int_a^b x\sqrt{1+(f(x))^2}dx$ **(f)** none of the above

(4) ☐ Which formula gives the arclength of the graph of x^2 over $[-1,1]$?

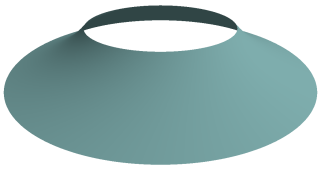
(a) $\int_{-1}^1 \sqrt{1+x^2}dx$ **(d)** $\int_{-1}^1 (1-2x)dx$ **(g)** $\int_{-1}^1 \sqrt{1-x^2}dx$
(b) $\int_{-1}^1 \sqrt{1+4x^2}dx$ **(e)** $\int_{-1}^1 (1+4x^2)dx$ **(h)** $\int_{-1}^1 \sqrt{1-4x^2}dx$
(c) $\int_{-1}^1 (1+2x)dx$ **(f)** $\int_{-1}^1 (1-4x^2)dx$ **(i)** none of the above

(5) ☐ Which integral gives the arclength of the graph of $\sin(x)$ between 0 and π?

(a) $\int_0^\pi \sqrt{1-\cos^2 x}dx$ **(d)** $\int_0^\pi (1+\sin x)dx$ **(g)** $\int_0^\pi \sqrt{1+\cos^2 x}dx$
(b) $\int_0^\pi (1+\sin^2 x)dx$ **(e)** $\int_0^\pi (1+\cos x)dx$ **(h)** $\int_0^\pi \sqrt{1-\sin^2 x}dx$
(c) $\int_0^\pi (1+\cos^2 x)dx$ **(f)** $\int_0^\pi \sqrt{1+\sin^2 x}dx$ **(i)** none of the above

(6) ☐ What is the formula for the surface area of the graph of $1/x$ for x in $[1,2]$ when rotated around the y-axis?

(a) $2\pi \int_1^2 x\sqrt{1-x^{-2}}dx$
(b) $\pi \int_1^2 \frac{\sqrt{1+x^{-2}}}{x}dx$
(c) $\pi \int_1^2 x\sqrt{1-x^{-2}}dx$
(d) $2\pi \int_1^2 \sqrt{1+x^2}dx$
(e) $2\pi \int_1^2 \sqrt{1+x^{-4}}dx$
(f) $2\pi \int_1^2 \sqrt{1+x^4}dx$
(g) $2\pi \int_1^2 x\sqrt{1+x^{-4}}dx$
(h) $\pi \int_1^2 x\sqrt{1+x^4}dx$
(i) $\pi \int_1^2 \frac{\sqrt{1-x^{-4}}}{x}dx$
(j) none of the above



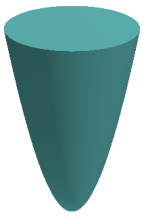
(7) ☐ What is the formula for the area of the surface formed by rotating the graph of $1/x$ between $x=1$ and $x=2$ around the x-axis?

(a) $2\pi \int_1^2 x\sqrt{1+x^{-2}}dx$
(b) $\pi \int_1^2 \frac{\sqrt{1-x^{-2}}}{x}dx$
(c) $2\pi \int_1^2 x\sqrt{1+2x^{-2}}dx$
(d) $\int_1^2 \sqrt{1+4x^{-2}}dx$
(e) $2\pi \int_1^2 \frac{\sqrt{1+x^{-4}}}{x}dx$
(f) $2\pi \int_1^2 \frac{\sqrt{1-x^{-4}}}{x}dx$
(g) $\pi \int_1^2 x\sqrt{1+2x^{-4}}dx$
(h) $2\pi \int_1^2 x\sqrt{1+4x^{-4}}dx$
(i) none of the above

(8) ☐ Which has **smaller** area: the surface in Problem 6 (rotating around x-axis) or the surface in Problem 7 (rotating around y-axis)? Put a "6" or "7" in the box.

(9) ☐ A water tank is shaped like the parabola x^2 on $[0,2]$ is rotated around the y-axis (see figure on right). The tank is 4 feet high and currently has 3 feet of water in it. The work required to pump all this water over the upper edge of the tank is 62.4 lb/ft^3 (the work needed to lift one cubic foot of water one foot high) times which integral below?

(a) $\pi \int_0^3 y^2(4-y)dy$
(b) $2\pi \int_0^4 y(4-y)dy$
(c) $2\pi \int_0^3 y(4-y)dy$
(d) $2\pi \int_0^3 \sqrt{y}(4-y)dy$
(e) $\pi \int_0^4 y(4-y)dy$
(f) $\pi \int_0^3 y(4-y)dy$
(g) $\pi \int_0^4 \sqrt{y}(4-y)dy$
(h) none of the above



(10) ☐ Coulomb's Law says that two negatively charged particles repel each other with a force kq_1q_2/x^2 Newtons, where q_1, q_2 are the sizes of the charges, x is the distance between them, and k is Coulomb's constant. If two particles have the same charge $q_1 = q_2 = q$ and are 2 meters apart, how much work in Newton-meters is needed to decrease this distance to 1 meter?

(a) $k^2q^2/2$
(b) $\frac{3}{8}kq$
(c) $kq^2/2$
(d) $2kq^2/2$
(e) $kq^2/4$
(f) kq
(g) $\frac{3}{4}kq^2$
(h) $\frac{2}{6}kq^2$
(i) $kq/2$
(j) none of the above

Answers: 1A, 2D, 3B, 4B, 5G, 6G, 7E, 8=7, 9F, 10C