Midterm 2 Review – KEY

6.1

1. (a) $e - \frac{1}{e} + \frac{4}{3}$
   (b) $\frac{3\pi^2}{8} - 1$
   (c) $\ln 2 - \frac{1}{2}$
   (d) $\frac{32}{3}$
   (e) $\frac{59}{12}$

6.2/6.3

1. (a) $\frac{6\pi}{7}$
   (b) $\frac{768\pi}{7}$
   (c) 8π
   (d) $\left(\frac{11}{30}\right)\pi$
   (e) $\frac{65\pi}{6}$
   (f) $\frac{4}{3}\pi r^3$
   (g) $h^2\pi\left(r - \frac{h}{3}\right)$

2. (a) $\frac{6\pi}{7}$
   (b) 8π
   (c) 4π
   (d) $\frac{62\pi}{5}$
   (e) $\pi - \frac{\pi}{e}$
   (f) $\frac{4}{3}\pi r^3$

3. (a) cyl. shells, $\frac{27\pi}{2}$
   (b) disk/washer, $\pi\left(\frac{e^4}{2} - \frac{e^2}{2}\right)$
   (c) disk/washer, $\frac{16\pi}{15}$
   (d) cyl. shells, 8π
   (e) disk/washer, $\frac{94\pi}{3}$
   (f) cyl. shells, $\frac{512}{5}\pi$

6.5

1. (a) $4/\pi$
   (b) $2/\pi$
   (c) $2/\pi$
   (d) $-\dfrac{4(\sqrt{2} - 2)}{3\pi}$

7.1

1. (a) $-\dfrac{t}{3} \cdot e^{-3t} - \dfrac{e^{-3b}}{9} + C$

(b) $-\dfrac{t^2 \cos 3t}{3} + \dfrac{2t \sin 3t}{9} + \dfrac{2 \cos 3t}{27} + C$

(c) $\dfrac{e^x \sin x + e^x \cos x}{2} + C$

(d) $2\sqrt{y} \ln y - 4\sqrt{y} + C$

(e) $x \sin^{-1} x + \sqrt{1 - x^2} + C$

7.2

1. (a) $\dfrac{\sin^3 x}{3} - \dfrac{\sin^5 x}{5} + C$

(b) $1/120$

(c) $\dfrac{\sin^3(\pi x)}{3\pi} - \dfrac{2\sin^5(\pi x)}{5\pi} + \dfrac{\sin^7(\pi x)}{7\pi} + C$

(d) $\dfrac{\sec^3 x}{15} + C$

(e) $\pi/4 - 2/3$

(f) $12/35$

(g) $\dfrac{22\sqrt{2}}{105} - \dfrac{8}{105} \approx .220121$

7.3

1. (a) $-\dfrac{\sqrt{5-x^2}}{5x} + C$

(b) $6 - 3\sqrt{3}$

(c) $\dfrac{64}{15} - \dfrac{11\sqrt{3}}{5} \approx .456155$

(d) $\dfrac{\sqrt{t^2-16}}{16t} + C$

(e) $2^{5/2}\left(\dfrac{(2+t^2)^{5/2}}{5 \cdot 2^{5/2}} - \dfrac{2(2+t^2)^{3/2}}{3 \cdot 2^{3/2}} + \dfrac{(2+t^2)^{1/2}}{\sqrt{2}}\right) + C$

$= \dfrac{\sqrt{t^2+2}\,(3t^4 - 8t^2 + 32)}{15} + C$

Integrals

1. (a) u-sub; $\dfrac{\sin^3 x}{3} + \sin x + C$

(b) trig sub; $\dfrac{(x^2+1)^{3/2}}{3} - \sqrt{x^2+1} + C = \dfrac{(x^2-2)\sqrt{x^2+1}}{3} + C$

(c) int. by parts; $\dfrac{243 \cdot \ln 3}{5} - \dfrac{242}{25} \approx 43.7126$

(d) trig integral methods; $-\dfrac{\cos^5 t}{5} + \dfrac{2\cos^7 t}{7} - \dfrac{\cos^9 t}{9} + C$

(e) u-sub; $2e^{\sqrt{t}} + C$

(f) u-sub; $\dfrac{\tan^4 \theta}{4} + C$

(g) trig identities then u-sub; $1/3$

(h) u-sub then trig int. methods; $\sin(\sin x) - \dfrac{\sin^3(\sin x)}{3} + C$

(i) trig sub; then half-angle: $\dfrac{\sin^{-1}(x)}{2} - \dfrac{x\sqrt{1-x^2}}{2}$ (NOT ON MIDTERM)

(j) int by parts: $(x^3 - 3x^2 + 6x - 6)e^x + C$

(k) int by parts; $\dfrac{e^x \sin x}{2} - \dfrac{e^x \cos x}{2} + C$

(l) u-substitution TWICE; $\sqrt{(\ln x)^2 + 1} + C$
    (use a different
     variable for 2nd time)