# Exam 1 Bingo Problems

1. Areas between curves:

   1.1. $y = x^2$ and $y = x + 2$

   1.2. $y = 4 - x$ and $y = 0$

   1.3. $y = x^2$ and $y = 2x$

   1.4. $y = x^3$ and $y = x$

   1.5. $y = e^x$ and $y = 2$

1.6. $y = \sin x$ and $y = 0$, $[0, \pi]$

1.7. $x = 4$ and $x = y^2$, $[-2,2]$

1.8. $y = 2$ and $y = |x|$, $[-2,2]$

2. Volumes between curves:
   2.1. Washer: $y = \sqrt{x}$ and $y = 0$, $[0,4]$, rotated about the x-axis

   2.2. Washer: $y = 2x$ and $y = x^2$, $[0,2]$, rotated about the x-axis

2.3. Washer: $x = y^2$ and $x = 4$, $[-2,2]$, rotated about the y-axis

2.4. Shell: under $y = x(2 - x)$ above $y = 0$, $[0,2]$, rotated about the y-axis

2.5. Washer: $y = x^2$ and $y = 0$, $[0,1]$, rotated about y=1

2.6. Shell: $x = y$ and $x = y^2$, $[0,1]$, rotated about the x-axis

2.7. Shell: $y = x$ and $y = 0$, $[0,3]$, rotated about the y-axis

3. Volumes of cylindrical shells:

3.1. Region under $y = x$ about the y-axis, $[0,2]$

3.2. Between $y = \sqrt{x}$ and $y = 0$ about the y-axis, $[0,4]$

3.3. Between $x = 0$ and $x = 4 - y^2$ about the x-axis, $[-2,2]$

3.4. Between $y = x$ and $y = 0$ about the line $x = 1$, $[0,1]$

4. Work:

4.1. A force of $F = 50N$ moves an object $d = 8m$

4.2. A force $F(x) = 3x^2 + 2\ (N)$ moves an object from $x = 0$ to $x = 4m$

4.3. A spring has $k - 200\ N/m$. Stretch it from 0 to 0.30 m

4.4. A 10m chain weighs 30 N total. Lift the whole chain up to the top.

4.5. A cylindrical tank: radius 2m, height 5m, full of water. Pump water out the top. Water weight density= $9800\ N/m^3$

4.6. An inverted cone: height 6m, top radius 3m, full of water. Pump to the top. Density= $9800\ N/m^3$

4.7. A bucket initially has 50kg of sand. Sand leaks out at 2kg/m as it's filled 10m. g=9.8

5. Average value of a function:
   5.1. $f(x) = x^2$ on $[0,3]$

   5.2. $f(x) = 2x + 1$ on $[1,4]$

   5.3. $f(x) = \sin x$ on $[0, \pi]$

   5.4. $f(x) = e^x$ on $[0,1]$

5.5. $f(x) = \frac{1}{x}$ on $[1, e]$

5.6. $f(x) = \begin{cases} x + 1, & -2 \leq x < 0 \\ 4 - x, & 0 \leq x \leq 3 \end{cases}$