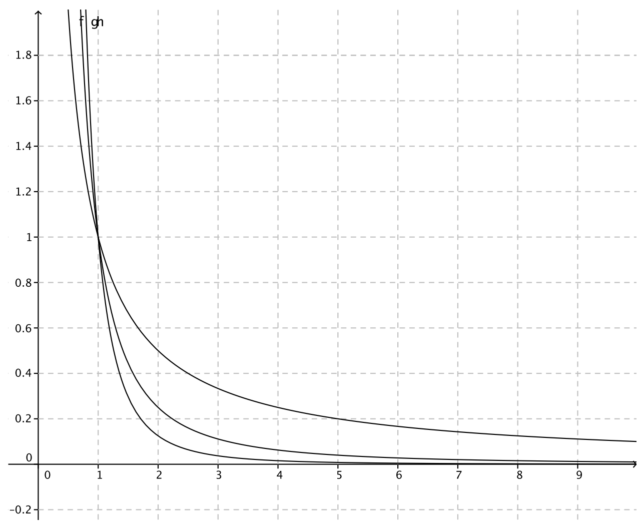
# MATH 3B

Discussion Worksheet - Thursday, May 31

**Improper Integration:**

- Recall, we say an integral *converges* if $\int_a^b f(x)\,dx =$
- We say an integral *diverges* otherwise.




Examples:

- $\int_1^\infty \frac{1}{x}\,dx =$
- $\int_1^\infty \frac{1}{x^2}\,dx =$
- $\int_1^\infty \frac{1}{x^3}\,dx =$

**FACTS and TESTS:**

- ***p*-Test**: If $a > 0$, then $\int_a^\infty \frac{1}{x^p}$ is convergent for

- **Divergence Test:** If $f(x) \nrightarrow 0$ as $x \to \infty$, then $\int_a^\infty f(x)\,dx$

- **Comparison Test:** If $f(x) \geqslant g(x) \geqslant 0$ on $[a, \infty)$, then:
  - if $\int_a^\infty f(x)\,dx$ , then $\int_a^\infty g(x)\,dx$
  - if $\int_a^\infty g(x)\,dx$ , then $\int_a^\infty f(x)\,dx$

**Arc Length:**

- If $f'$ is continuous on $[a, b]$, then the length of the curve

$$y = f(x), a \leqslant x \leqslant b \text{ is given by } L =$$

- Strategies:

- Example: Find the length of the curve $y = \ln(\cos(x))$ where $0 \leqslant x \leqslant pi/3$

**Surface Area:**

- The surface area obtained by rotating the curve $y = f(x)$, $a \leqslant x \leqslant b$ about the $x$-axis is given by

- Where does this formula come from?

- If you're rotating about the $y$-axis, the curve is given as $x = g(y)$ from $c \leqslant y \leqslant d$ then the formula for surface area becomes

- Example: Write the formula that represents the area of the surface obtained by rotating the curve $y = e^x$, $1 \leqslant y \leqslant 2$ about the $y$-axis.