

MATH 32 MIDTERM 2 REVIEW

This is just a list of the main concepts and skills we've explored so far this semester. Its purpose is to help you organize your studying for the midterm exam. Of course, not everything on the exam will correspond exactly to an item on this list, and not everything on this list will be covered on the exam!

- Exponents and logs:

- Rational exponents. $x^{\frac{a}{b}} = (\sqrt[b]{x})^a$.

- Properties of exponents and logs.

$$x^a \cdot x^b = x^{a+b}$$

$$\log_b(s \cdot t) = \log_b(s) + \log_b(t)$$

$$\frac{x^a}{x^b} = x^{a-b}$$

$$\log_b\left(\frac{s}{t}\right) = \log_b(s) - \log_b(t)$$

$$(x^a)^b = x^{ab}$$

$$\log_b(s^t) = t \log_b(s)$$

$$x^a y^a = (xy)^a$$

$$\log_b(x) = \frac{\log_a(x)}{\log_a(b)} \quad (\text{"Change of base"})$$

- Geometry:

- Distance. The distance between (x_1, y_1) and (x_2, y_2) is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

- Midpoint. The midpoint of the line segment connecting (x_1, y_1) and (x_2, y_2) is

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right).$$

- Perimeter of polygons, circumference of circles.

- Areas of rectangles, triangles, parallelograms, trapezoids, circles, ellipses.

- Formulas describing circles and ellipses.

The circle with center (h, v) and radius r is given by $(x - h)^2 + (y - v)^2 = r^2$.

The ellipse with center (h, v) , horizontal radius a , and vertical radius b is given

by $\frac{(x-h)^2}{a^2} + \frac{(y-v)^2}{b^2} = 1$.

- Preview of calculus and motivation for e and \ln :

- Approximating the area under a curve by rectangles.

- Defining \ln and e in terms of the area under the curve $\frac{1}{x}$.

- Approximation formulas for e and \ln .

$$\ln(1 + t) \approx t \quad (\text{for small } t)$$

$$e^t \approx 1 + t \quad (\text{for small } t)$$

$$e^t \approx \left(1 + \frac{t}{n}\right)^n \quad (\text{for large } n \text{ and any } t)$$

- Applications:

- Exponential growth (example: population growth).

- Exponential decay (example: radioactive half-life).

- Compound interest (compounded n times per year and continuously).

- Continuous growth rate.