

MATH 146 6.1 Continuous Probability Distributions - The Standard Normal Distribution

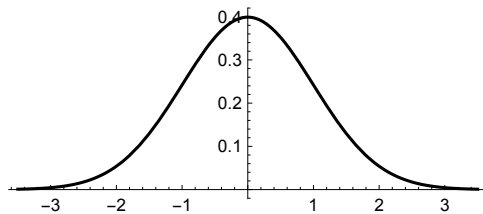
UNIFORM DISTRIBUTIONS

Create a probability distribution for the outcomes of rolling a single die.

EXAMPLE 1 Suppose a bus leaves Skagit Valley College every eight minutes. This means a persons wait time will always be between 0 and 8 minutes, and is uniformly distributed. Draw the *probability density function* for wait times, and calculate the probability of having to wait between 4.5 and 7 minutes.

THE STANDARD NORMAL DISTRIBUTION

- 1) The density function for the standard normal function is bell-shaped,
- 2) has parameters $\mu = 0$ and $\sigma = 1$; $N(0, 1)$
- 3) the total area under the curve from $-\infty < z < \infty$ equals 1.



CALULATING AREAS

EXAMPLE 2 Use Table A-2 (back of the text) to calculate the following areas. Draw a normal curve and the indicated area.

- a) Less than $z = -1.37$
- b) Greater than $z = 0.52$
- c) Between $z = -0.70$ and $z = 2.27$

USING THE TI CALCULATOR

Use $\text{normalcdf}(z_1, z_2)$ to calculate the area (probability) between z_1 and z_2 . For left-hand tails use $z_1 = -1 \times 10^{99}$ for $-\infty$, and for right-hand tails use $z_2 = 1 \times 10^{99}$ for $+\infty$. (Press 1 2nd EE 99)

EXAMPLE 3 A normal distribution has mean $\mu = 0$ and standard deviation $\sigma = 1$. Calculate the following probabilities and use a normal curve to indicate the value.

- $P(z < 1.5)$
- $P(-0.70 < z < 2.27)$ Compare with part (c) above.
- $P(z > 2.3)$
- $P(-2 < z < 2)$

Finding z-scores From Areas

On the TI-84, $\text{invNorm}(p)$ calculates the z-score that will give a left-hand tail area of p .

EXAMPLE 4 Find the following z-scores for the given areas (probabilities):

- Left-hand tail area is 0.35.
- Right-hand tail area is 0.10 (Note: this is the 90th percentile, or P_{90}).
- The z-scores with left-hand tail area 0.025, and right-hand-tail area 0.025.

Critical Values

A *critical value* is the z-score that separates unlikely values from likely values: z_α represents the z-score that gives a **right-hand** tail area of α .

EXAMPLE 5 Find z_α for $\alpha = 0.025$, or $z_{0.025}$, and $z_{0.01}$.