1. What is the value of

$$\int_0^1 \frac{1}{\sqrt{1-x}}\,dx?$$

(a) 0

(b) $\sqrt{2}$

(c) 1

(d) -1

(e) 2

(f) It diverges.

$$\int_0^1 \frac{1}{\sqrt{1-x}}\,dx = \lim_{t\to 1^-} \int_0^t \frac{1}{\sqrt{1-x}}\,dx = \lim_{t\to 1^-} -2(1-x)^{\frac{1}{2}}\Big|_0^t$$

$$= \lim_{t\to 1^-} \left(-2(1-t)^{\frac{1}{2}} + 2\right) = 2$$

2

2. Evaluate

$$\int_0^4 \frac{2}{3x-2}\,dx.$$

(a) $\frac{1}{\ln 2}$

(b) 0

(c) 1

(d) $-\ln 5$

(e) $\ln 4$

(f) It diverges.

$3x-2=0$ if $x=\frac{2}{3}$

$$\int_0^4 \frac{2}{3x-2}\,dx = \int_0^{\frac{2}{3}} \frac{2}{3x-2}\,dx + \int_{\frac{2}{3}}^4 \frac{2}{3x-2}\,dx$$

$$\int_0^{\frac{2}{3}} \frac{2}{3x-2}\,dx = \lim_{t\to\frac{2}{3}^-} \int_0^t \frac{2}{3x-2}\,dx = \lim_{t\to\frac{2}{3}^-} \frac{2}{3}\ln|3x-2|\Big|_0^t$$

$$= \lim_{t\to\frac{2}{3}^-} \frac{2}{3}\ln|3t-2| - \frac{2}{3}\ln 2 = -\infty$$

The integral diverges

3. The average time to answer a phone call at a call center is 4 minutes. What is the probability that the phone is answered in more than 1 minute?

(a) $\frac{3}{4}$

(b) $e^{-\frac{1}{4}}$

(c) $e^{\frac{1}{4}}$

(d) $1 - \frac{1}{e}$

(e) $1 - \frac{4}{e}$

(f) $\frac{4}{e}$

$\mu = 4$, so $c = \frac{1}{4}$, so $f(x) = \frac{1}{4} e^{-\frac{x}{4}}$

$$P(X > 1) = \int_1^\infty \frac{1}{4} e^{-\frac{x}{4}} \, dx = \lim_{t \to \infty} -e^{-\frac{x}{4}} \Big|_1^t = \lim_{t \to \infty} -e^{-\frac{t}{4}} + e^{-\frac{1}{4}} = e^{-\frac{1}{4}}$$