By

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In [1]:
```
using Distributions;
using Gadfly;
```

Question 1

In [2]:
```
d = Gamma(4,1.5)
cdf(d,2)
```

Out[2]: 0.04649430286533402

Question 2

Part a

In [3]:
```
d2 = Normal(600,40)
1-cdf(d2,700)
```

Out[3]: 0.006209665325776159

Part b

In [5]:
```
cquantile(d2,0.1)
```

Out[5]: 651.262062621784

In [36]:
```
# Using a for loop
for x in collect(600:10:680)
    println("at ", x, " cdf is " ,cdf(d2,x))
end
```

```
at 600 cdf is 0.5
at 610 cdf is 0.5987063256829237
at 620 cdf is 0.6914624612740131
at 630 cdf is 0.7733726476231318
at 640 cdf is 0.841344746068543
at 650 cdf is 0.8943502263331448
at 660 cdf is 0.9331927987311419
at 670 cdf is 0.9599408431361829
at 680 cdf is 0.9772498680518208
```

We can see from above results that cdf of 0.9 is achieved near x = 650

Question 3

In [6]:
```
d3 = Beta(4,2)
1-cdf(d3,0.3)
```

Out[6]: 0.96922

Question 4

In [8]:
```
d4 = Weibull(2,4)
cdf(d4,2)
```

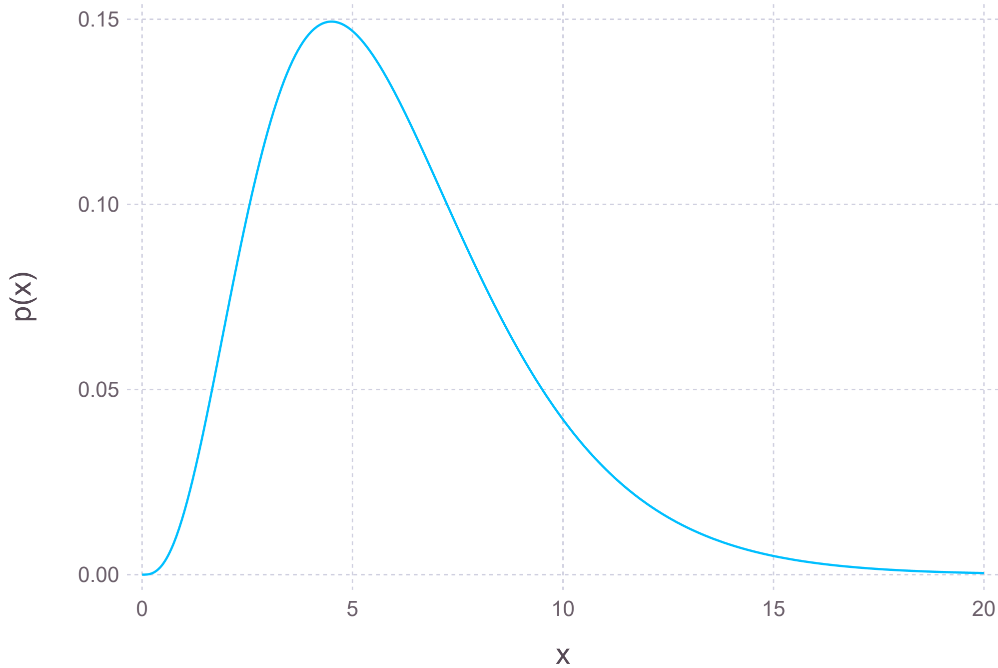
Out[8]: 0.22119921692859512

Question 5, pdfs

Question 1, Gamma Distribution

In [18]:
```
xax = collect(0:0.01:20);
gpdf = pdf.(d,xax)
myplot = plot(x =xax, y = gpdf, Geom.line, Coord.Cartesian(xmin = 0, xmax =20
), Guide.ylabel("p(x)") )
```

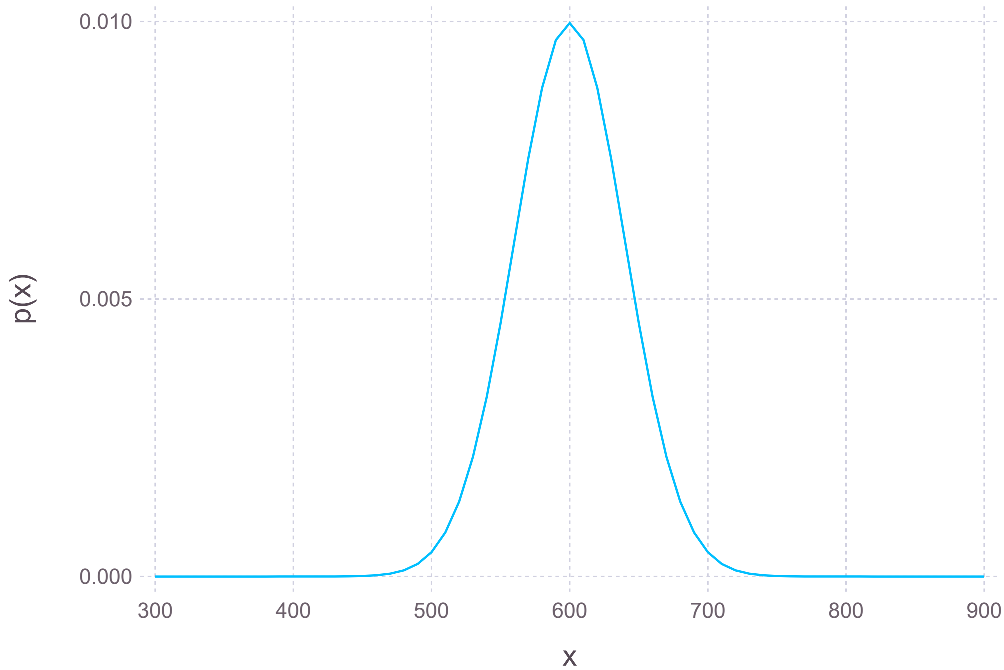
Out[18]:



Question 2, Normal Distribution

In [20]:
```
xax = collect(300:10:900);
gpdf = pdf.(d2,xax)
myplot = plot(x =xax, y = gpdf, Geom.line, Coord.Cartesian(xmin = 300, xmax =9
00), Guide.ylabel("p(x)") )
```

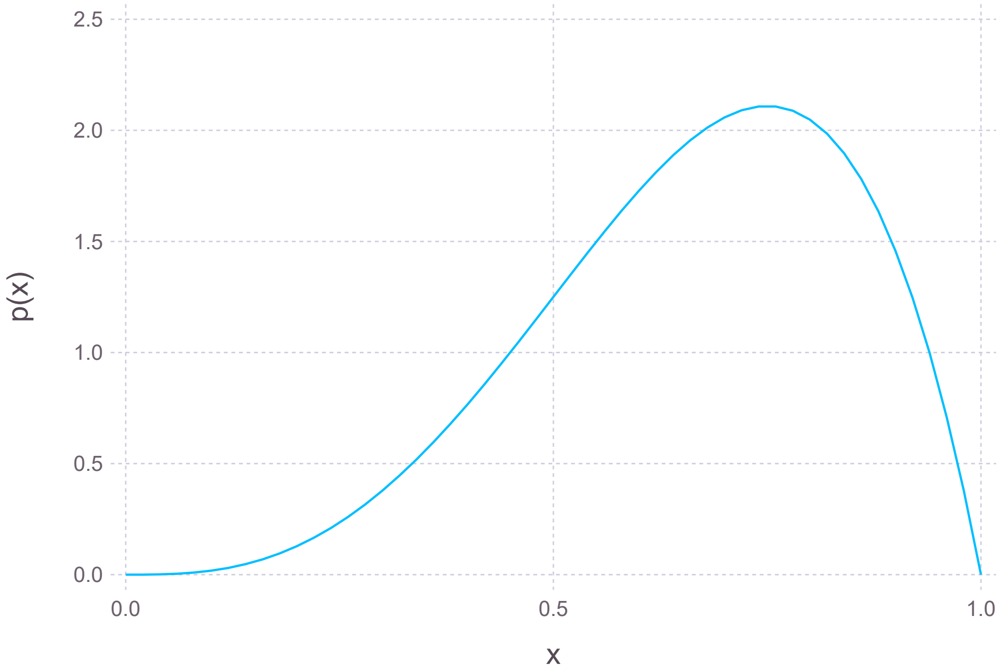
Out[20]:



Question 3, Beta Distribution

In [23]:
```
xax = collect(0:0.02:1);
gpdf = pdf.(d3,xax)
myplot = plot(x =xax, y = gpdf, Geom.line, Coord.Cartesian(xmin = 0, xmax =1),
Guide.ylabel("p(x)") )
```

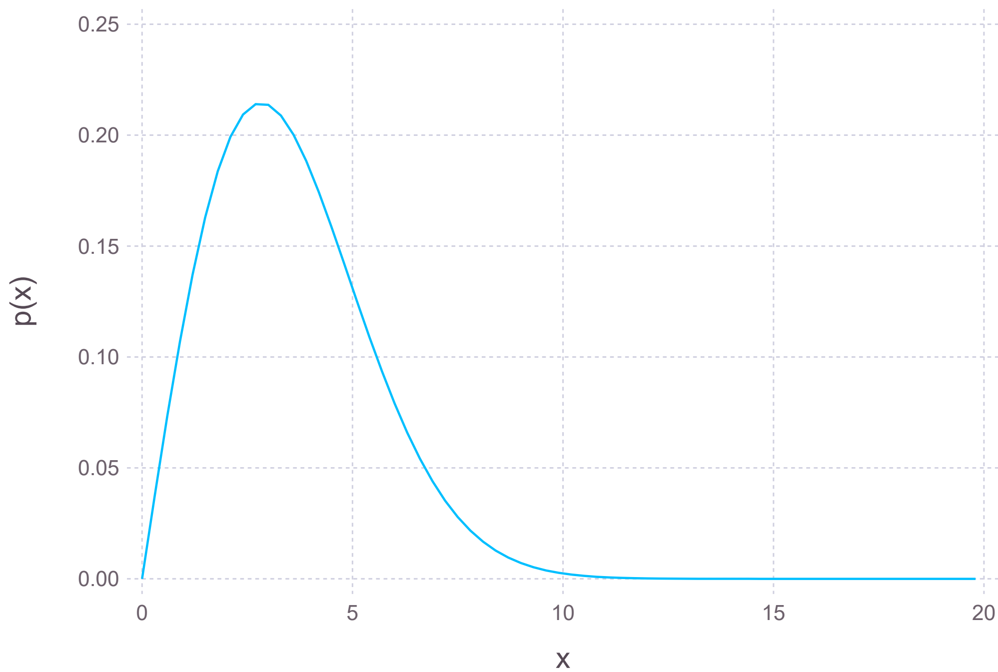
Out[23]:



Question 4, Weibull Distribution

In [25]:
```
xax = collect(0:0.3:20);
gpdf = pdf.(d4,xax)
myplot = plot(x =xax, y = gpdf, Geom.line, Coord.Cartesian(xmin = 0, xmax =20
), Guide.ylabel("p(x)") )
```

Out[25]:



Assignment 6

1). $\alpha = 4 \quad \beta = 1.5$

a).

$$P(x \le 2) = \int_0^2 f(x)\,dx$$

$$= \int_0^2 \frac{1}{\Gamma(4)\,1.5^4} x^3 e^{\frac{-x}{1.5}}$$

$= 0.046$ (calculator on julia)

b). $g(x) = l = 30x + 2$

$$E(g(x)) = \int_0^\infty g(x) f(x)\,dx$$

$$= \int_0^\infty (30x+2) f(x)\,dx$$

$$= \int_0^\infty 30x f(x)\,dx + 2\int_0^\infty f(x)\,dx$$

$$= 30 \int_0^\infty x f(x)\,dx + 2(1)$$

$$= 30(\alpha\beta) + 2(1)$$

$$= 30 \times 6 + 2(1)$$

$$= 182.$$

$$E(g(x)^2) = \int_0^\infty (g(x))^2 f(x)\,dx$$

$$= \int_0^\infty (30x+2)^2 f(x)\,dx$$

$$= \int_0^\infty (30^2x^2 + 120x + 4)$$

$$= \int_0^\infty 30^2x^2 f(x)\,dx + \int_0^\infty 120x$$

$$+ 4\int_0^\infty f(x)\,dx$$

$$= 30^2 \int_0^\infty x^2 f(x)\,dx + 120$$

$$+ 4(1).$$

$$= 30^2 \int_0^\infty x^2 f(x)\,dx + 72$$

$= 30^2 \cancel{(\alpha(\alpha+1)\beta^2 + 724}$

$= \cancel{30^2(4 \times 5 \times 1.5 \times 1.5) + 724}$

$\sigma^2(\log e^x) = \sigma^2(30x+2)$

$= 900\,\sigma^2(x)$

$= 900 \times 4 \times 1.5 \times 1.5$

$= 8100$

2)

a) $\mu = 600 \quad \sigma = 40$

$P(x > 700) = \int_{700}^{\infty} f(x)\,dx$

$= \int_{700}^{\infty} \frac{1}{40\sqrt{2\pi}} e^{-\frac{(x-600)^2}{2 \times 40}}\,dx$

$= 0.006$

b)

$P(x > a) = 0.1$

$\int_{a}^{\infty} \frac{1}{40\sqrt{2\pi}} e^{-\frac{(x-600)^2}{2 \times 40}}\,dx = 0.1$

$=$

3)

$$f(x) = \begin{cases} 20x^3(1-x) & 0 \le x \le 1 \\ 0 & \text{otherwise} \end{cases}$$

$\alpha = 4 \quad \beta = 2$

a)

$P(x \geq 0.3) = \int_{0.3}^{1} 20x^3(1-x)\,dx$

$= 0.969$

b) $g(x) = Y = 10 - 0.75x$

$E(g(x)) = \int_0^1 10 f(x)\,dx - \int_0^1 0.75x\, f(x)\,dx$

$= 10(1) - 0.75\left(\frac{4}{6}\right)$

$= 10 - \frac{3}{4}\,\frac{2}{3} = 19/2$

(4) Weibull $\gamma = 2$, $\theta = 4$

(a) $P(x < 2)$

$$f(x) = \frac{\gamma}{\theta} x^{\gamma - 1} e^{-\frac{x^{\gamma}}{\theta}} \qquad x > 0$$

$$= \frac{2}{4} x^{1} e^{-\frac{x^2}{4}}$$

$$\therefore P(x < 2) = \int_0^{2} \frac{x}{2} e^{-\frac{x^2}{4}} \, dx$$

Julia $\Rightarrow$ $\underline{0.22}$

(b) $$E(x) = \int_0^{\infty} \frac{x^2}{2} e^{-\frac{x^2}{4}} \, dx$$

$$= 4^{1/2} \, \Gamma\left(1 + \frac{1}{2}\right)$$