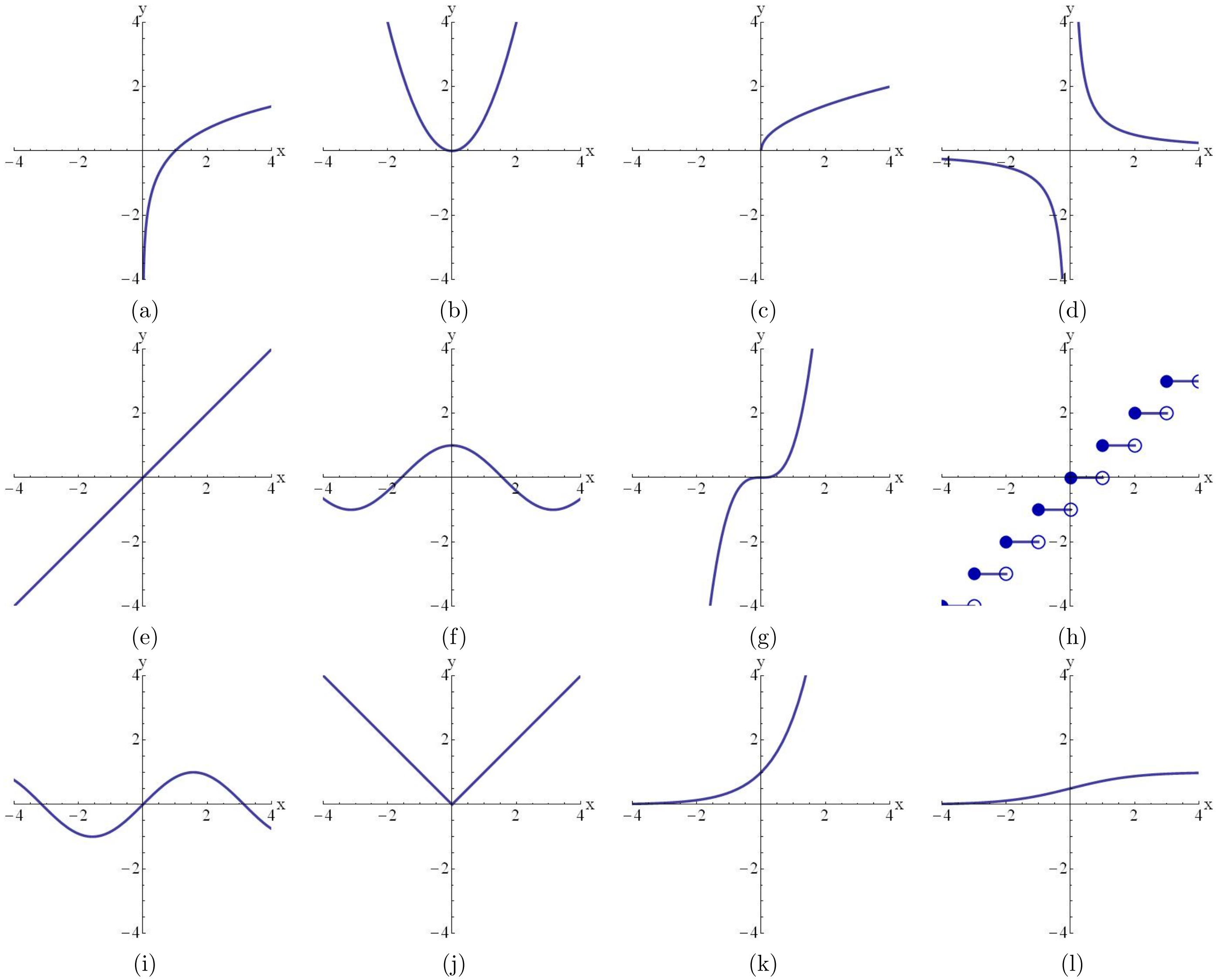
Questions

1. Write down the function $f(x)$ for each of the functions sketched below.



2. Sketch each of the functions:

(a) $f(x) = x$ (b) $f(x) = x^2$ (c) $f(x) = x^3$ (d) $f(x) = \dfrac{1}{x}$
(e) $f(x) = \sqrt{x}$ (f) $f(x) = e^x$ (g) $f(x) = \ln x$ (h) $f(x) = \sin x$
(i) $f(x) = \cos x$ (j) $f(x) = |x|$ (k) $f(x) = \text{int}(x)$ (l) $f(x) = \dfrac{1}{1+e^{-x}}$

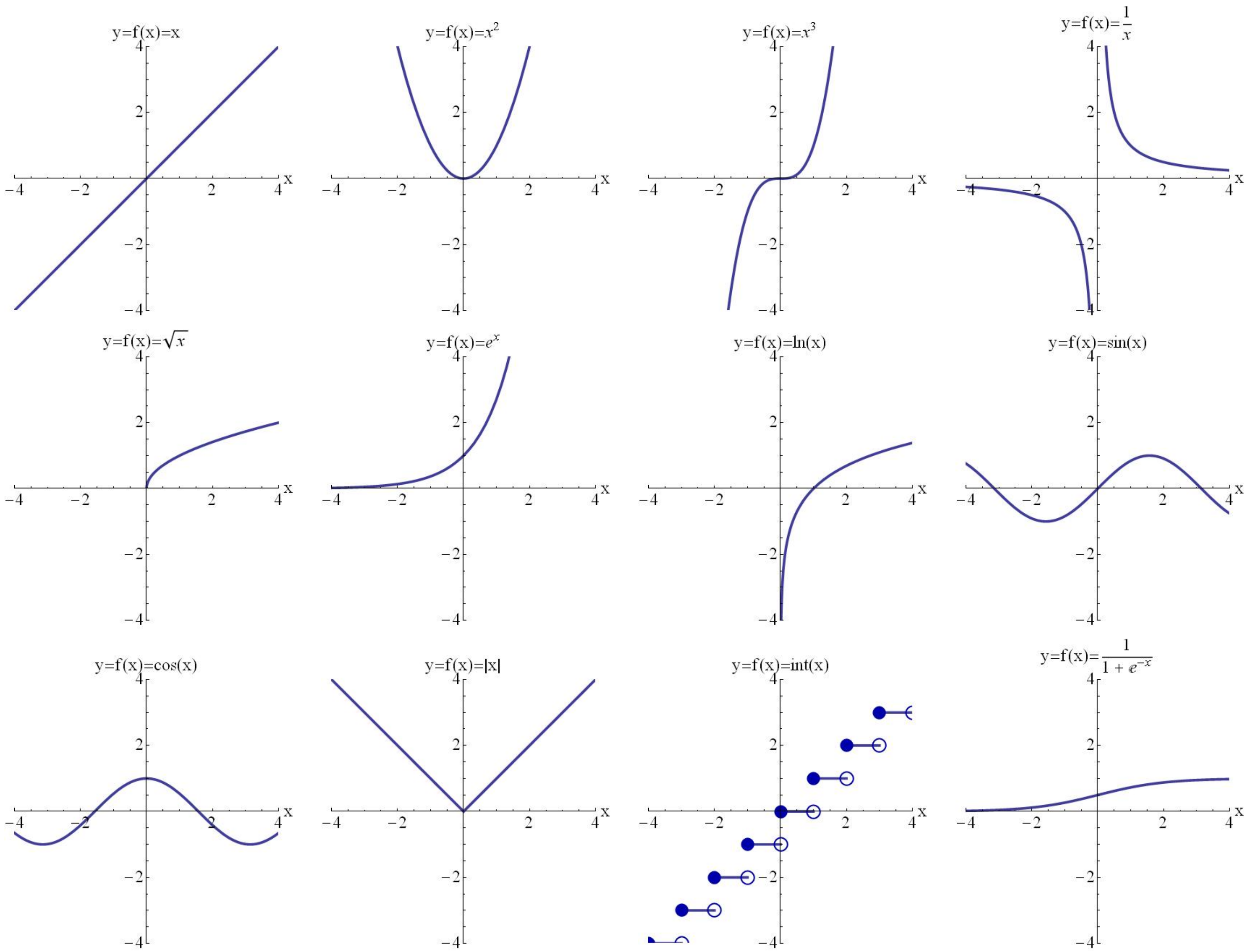
3. Of the 12 Basic Functions, identify the six functions that are increasing over their entire domain.

4. Of the 12 Basic Functions, identify the functions which are odd, and which ones are even.

5. Does the graph of the function $f(x) = \ln x$ have a horizontal asymptote? Does the logistic function have a horizontal asymptote?

Solutions

1. and 2.



3. Increasing over entire domain: $f(x) = x$, $f(x) = x^3$, $f(x) = \sqrt{x}$, $f(x) = e^x$, $f(x) = \ln x$, $f(x) = \dfrac{1}{1+e^{-x}}$.

4. Odd: $f(x) = x$, $f(x) = x^3$, $f(x) = \dfrac{1}{x}$, $f(x) = \sin x$.

Even: $f(x) = x^2$, $f(x) = \cos x$, $f(x) = |x|$.

5. The logarithmic function $f(x) = \ln x$ does not have a horizontal asymptote. It grows slowly as x grows. We can say this mathematically as $\lim_{x\to\infty} \ln x = \infty$.

The logistic function $f(x) = \dfrac{1}{1+e^{-x}}$ has two horizontal asymptotes. It approaches 1 as $x \to \infty$, and it approaches 0 as $x \to -\infty$. We can say this mathematically as $\lim_{x\to\infty} \dfrac{1}{1+e^{-x}} = 1$ and $\lim_{x\to-\infty} \dfrac{1}{1+e^{-x}} = 0$.