

MATH 112 SOLUTIONS FOR SECTION 2.4, P. 142

1. (a) 1. (c)  $-1$ . (f)  $\frac{\pi}{2}$ . (g) 0. (h) 2. (k) 0. (l) 1. (m) 0.
3.  $\sin x$  is bounded and  $\frac{1}{x} \rightarrow 0$  as  $x \rightarrow \infty$ ; use Theorem 34.
5. (b)  $-1$  (e) 0. (f) 1 (h) 1
8. (b)  $y = 1$  (c) none (d)  $y = \frac{\pi}{2}$  and  $y = -\frac{\pi}{2}$
9. (b)  $\infty$ . (c) DNE. (d)  $-\infty$ . (g)  $\infty$ . (h)  $-\infty$ .
10. (b)  $F \rightarrow \infty$  and  $G \rightarrow \infty$  as  $x \rightarrow \infty$ ,  $F \rightarrow -\infty$  and  $G \rightarrow -1$  as  $x \rightarrow -\infty$ .
11. (c)  $x^3 \rightarrow \infty$  as  $x \rightarrow \infty$  and  $x^3 \rightarrow -\infty$  as  $x \rightarrow -\infty$ . (d)  $x^4 - x^3 \rightarrow \infty$  as  $x \rightarrow \pm\infty$ . (e)  $e^x \rightarrow \infty$  as  $x \rightarrow \infty$  and  $e^x \rightarrow 0$  as  $x \rightarrow -\infty$ . (f)  $e^{-x^2} \rightarrow 0$  as  $x \rightarrow \pm\infty$ . (g)  $\ln|x| \rightarrow \infty$  as  $x \rightarrow \pm\infty$ ,  $\ln|x| \rightarrow -\infty$  as  $x \rightarrow 0$ . (i)  $x^{2/3} \rightarrow \infty$  as  $x \rightarrow \pm\infty$ .
12. (a)  $x = 1$ . (b)  $x = 2$ . (c)  $x = 2$  and  $x = 4$ . (d)  $x = 0$ .
13. (c) vertical:  $x = 1$ ; horizontal:  $y = 0$ .
14. (b)  $\lim_{x \rightarrow c^-} f(x) = \infty$  if and only if, for any  $B > 0$  there exists  $\delta > 0$  such that if  $0 < c - x < \delta$  then  $f(x) > B$ .