MA 161 Exam 1, Spring 2004

1. The domain of the function $f(x) = \sqrt{|x+2| - 3}$ is

   A. $(-\infty, -1] \cup [5, \infty)$

   B. $[-1, 5]$

   C. $[-5, 1]$

   D. $[5, \infty)$

   E. $(-\infty, -5] \cup [1, \infty)$

$x+2 \geq 3 \Rightarrow x \geq 1$

or or

$x+2 \leq -3 \Rightarrow x \leq -5$

2. Let l_1 and l_2 be two parallel lines. If l_1 contains the points $(1,2)$ and $(3,6)$ and if l_2 contains $(-1,1)$ find the equation for l_2.

   A. $y = 2x + 3$

   B. $y = 2x - 1$

   C. $y = 2x + 1$

   D. $y = 2x + 2$

   E. None of the above.

$2 = \frac{y-1}{x+1}$

3. If $sin\ \theta = \frac{1}{2}$ and $\frac{\pi}{2} \leq \theta \leq \pi$ then $sec\ \theta =$

   A. 2

   B. -2

   C. $\frac{\sqrt{3}}{2}$

   D. $\frac{-2}{\sqrt{3}}$

   E. $\frac{2}{\sqrt{3}}$

$\cos\theta = -\frac{\sqrt{3}}{2}$,

$\sec\theta = -\frac{2}{\sqrt{3}}$

4. If $f(x) = \begin{cases} 2x+1 & \text{if } x < 1 \\ 3-x & \text{if } x \geq 1 \end{cases}$ and $g(x) = x^2$ then $(f \circ g)(2)$ equals

$g(2) = 4,\ f(4) = 3-4$

A. 9

B. -1

C. 1

D. -9

E. 25

5. If $\frac{e^{x^2} e^6}{e^{5x}} = 1$ then $x =$

$x^2 - 5x + 6 = 0$

$(x-3)(x-2) = 0$

A. -3 or -2

B. -2 or 3

C. 2 or 3

D. 2 or -3

E. None of the above.

6. The limit $\lim_{x \to 4} \dfrac{x^2 - 3x - 4}{x - 4}$ equals

$$\frac{(x+1)(x-4)}{(x-4)}$$

$$\lim_{x \to 4} (x+1) = 5$$

A. 1

B. -1

C. 5

D. -5

E. does not exist

7. If $f(x) = ln(e^{3x} + 1)$ then $f^{-1}(x)$ equals

A. $\frac{1}{3}ln(e^x + 1)$

B. $ln(\frac{(e^x-1)}{3})$

C. $3ln(e^x - 1)$

D. $ln(3(e^x + 1))$

E. $\frac{1}{3}\ ln(e^x - 1)$

$e^y = e^{3x} + 1$

8. The limit $\lim_{x\to 0}(\frac{1}{x(1+x)} - \frac{1}{x})$ equals

A. 2

B. 1

C. 0

D. -1

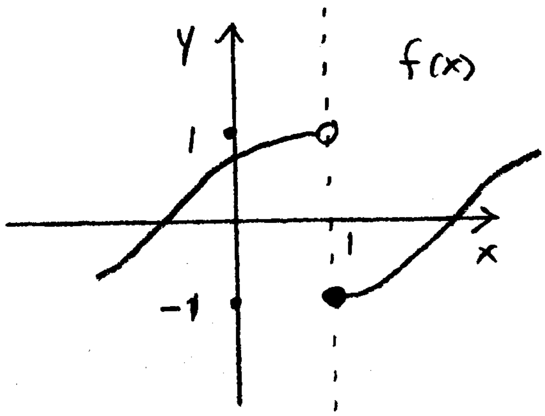
E. does not exist

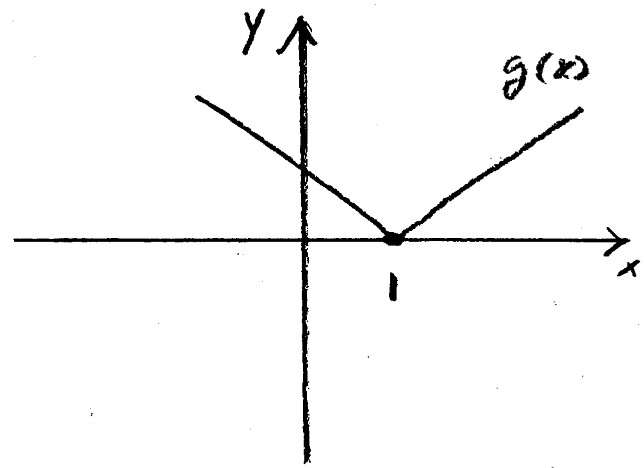
$$\frac{1-(1+x)}{x(1+x)} = \frac{-x}{x(1+x)}$$

$$= \frac{-1}{1+x}$$

$$\lim_{x\to 0}\left(\frac{-1}{1+x}\right) = -1$$

Problems 9 - 11 refer to the graphs below:





9. $\lim_{x\to 1} f(x)\cdot g(x)$ equals

A. 0

B. -1

C. 1

D. $\frac{1}{2}$

E. does not exist

$\lim_{x\to 1^-} f\cdot g = \lim_{x\to 1^-} f \cdot \lim_{x\to 1^-} g = 1\cdot 0 = 0$

$\lim_{x\to 1^+} f\cdot g = \lim_{x\to 1^+} f \cdot \lim_{x\to 1^+} g = -1\cdot 0 = 0$

10. $\lim_{x\to 1^-} (x+2f(x))$ equals

A. 3

B. 2

C. 1

D. 4

E. does not exist

$\lim_{x\to 1^-} x + 2\lim_{x\to 1^-} f$

$= 1 + 2\cdot 1 = 3$

11. $\lim_{x\to 1+} \frac{f(x)}{g(x)}$ equals

A. ∞

B. 0

C. $-\infty$

D. -1

E. does not exist

$g > 0$ and $g \to 0$ as $x \to 1^+$

$\lim_{x\to 1^+} f = -1$

$\Rightarrow \lim_{x\to 1^+} \frac{f}{g} = -\infty$

12. The graph of $h(x) = x^2$ is first compressed vertically by a factor of 2, then shifted to the right by 3 units, and then reflected about the y-axis. The final equation is

A. $2(x+3)^2$

B. $\frac{1}{2}(x-3)^2$

C. $2(x-3)^2$

D. $\frac{1}{2}(x+3)^2$

E. None of the above.

$\frac{1}{2}(-x-3)^2$

$= \frac{1}{2}(x+3)^2$

13. A bacteria population triples each $\frac{1}{2}$ hour. If the initial population is 200, then the population $P(t)$ after t hours is

A. $P(t) = 200 \cdot 3^t$

B. $P(t) = 200 \cdot 3^{2t}$

C. $P(t) = 200 \cdot 3^{\frac{t}{2}}$

D. $P(t) = 200 \cdot (\frac{3}{2})^t$

E. $P(t) = 200 \cdot 6^t$.

$P(\frac{n}{2}) = 200\, 3^n$

let $t = \frac{n}{2}$

14. Let $f(x) = x^2$, $g(x) = \frac{1}{x}$, $h(x) = \frac{1}{x^2}$, $k(x) = x^3$. Then

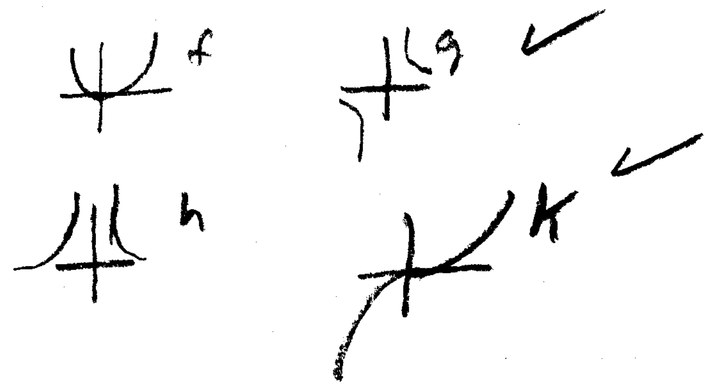
A. f and g are one to one.

B. g and h are one to one.

C. f and h are one to one.

D. h and k are one to one.

E. g and k are one to one.



15. The domain of f(x) $= \frac{1}{\sqrt{2+x-x^2}}$ is

A. $(-1, 2)$

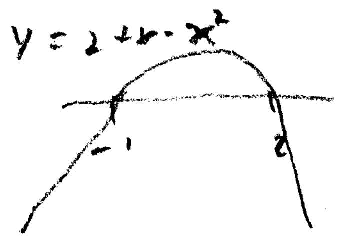
B. $(-2, -1)$

C. $(-2, 1)$

D. $(1, 2)$

E. $(-2, 2)$

$2 + x - x^2 > 0$



16. If $f(x) = \begin{cases} 1 + x & \text{if } x < 0 \\ 2x + 1 & \text{if } 0 \le x < 1 \\ 2x & \text{if } 1 \le x \end{cases}$ which of the following statements is true?

A. $\lim_{x\to 0} f(x) = 1$ and $\lim_{x\to 1} f(x) = 3$

B. $\lim_{x\to 0} f(x) = 1$ and $\lim_{x\to 1} f(x) = 2$

C. $\lim_{x\to 0} f(x)$ does not exist and $\lim_{x\to 1} f(x) = 3$

D. $\lim_{x\to 0} f(x) = 1$ and $\lim_{x\to 1} f(x)$ does not exist

E. None of the above.

$\lim_{x\to 0^\pm} f = 1$

$\lim_{x\to 1^-} f = 3$

$\lim_{x\to 1^+} f = 2$