(1)

(a) $f(x) = -3x^2+4$

$f(-x) = -3(-x)^2+4 = -3x^2+4 = f(x) \Rightarrow$ even

(b) $f(x) = 2x^3-4x$

$f(-x) = 2(-x)^3-4(-x) = -2x^3+4x = -(2x^3-4x) = -f(x) \Rightarrow$ odd

(c) $f(x) = x^3 - \sin(3x)$

$f(-x) = (-x)^3 - \underbrace{\sin(-3x)}_{=-\sin(3x)} = -x^3+\sin(3x) = -(x^3-\sin(3x)) = -f(x) \Rightarrow$ odd

sin is odd

(d) $f(x) = x^3+\cos(3x)$

$f(-x) = (-x)^3 + \underbrace{\cos(-3x)}_{=\cos(3x)} = -x^3+\cos(3x)$ neither

cos is even

(e) $f(x) = 2x^3-3x^2-4x+4$

$f(-x) = -2x^3-3x^2+4x+4$ neither

(2) Use IVT to show that $f(x) = x^3+x$ takes on the value 9 for some $x \in (1,2)$.

$f(1) = 2$

$f(2) = 10$

f is continuous on $[1,2]$ and $2 = f(1) < 9 < 10 = f(2)$, so by IVT, there is $c \in (1,2)$ such that $f(c) = 9$.

(3) $f(x) = \frac{1}{x+1}$; $\frac{f(1+h)-f(1)}{h} = \frac{\frac{1}{(1+h)+1} - \frac{1}{2}}{h} = \frac{\frac{1}{h+2} - \frac{1}{2}}{h} = \frac{\cancel{2}-(h+\cancel{2})}{2h(h+2)}$

$= \frac{-h}{2h(h+2)} = \frac{-1}{2(h+2)} = \frac{-1}{2h+4}$

a). $\frac{h}{h+1}$ b) $\frac{-1}{4+2h}$ c) $\frac{-1}{2h+1}$ d) $\frac{1}{4}$

4. $A = \lim_{x \to 1} \dfrac{x+2}{x(x-3)} = \dfrac{3}{-2}$

$B = \lim_{x \to 1} \dfrac{x^2-3x+2}{x^2+x-2} \; (0/0) = \lim_{x \to 1} \dfrac{\cancel{(x-1)}(x-2)}{\cancel{(x-1)}(x+2)} = \dfrac{-1}{3}$

a). $A = \frac{3}{2}$, B dne b). $A = -\frac{3}{2}$, $B = 3$ c)) $A = -\frac{3}{2}$, $B = -\frac{1}{3}$, d) both dne.

5. $A = \lim_{x \to 3^+} \dfrac{x(x+1)}{3-x} = \dfrac{3 \cdot 4}{0_-} = -\infty$

$B = \lim_{x \to \infty} \dfrac{(x^2+2)(3x^2-5)}{x^4+6} = \dfrac{3}{1} = 3$ (same degree)

a). $A = -\infty$, $B = -\frac{10}{6}$; b). $A = 0$, $B = 0$; c). $A = \infty$, $B = \infty$; d).) $A = -\infty$, $B = 3$.

6. If $f(2) = 3$, and $f'(2) = -1$, eqn. of tangent line to the graph of $y = f(x)$ at the point where $x = 2$?

Slope: -1
Point: $(2,3)$

$y - 3 = -1(x-2)$
$= -x + 2$

$y = -x + 5$

a) $y = 5 - x$
b). $y = 7 - x$
c). $y = 3x - 1$
d) $y = x + 1$

7. An armadillo is walking along a straight road and is $s(t) = 12t^2 - t^3$ inches along the road after t minutes $(0 \le t \le 8)$. What is its acceleration when $t = 2$?

$v(t) = 24t - 3t^2$
$a(t) = 24 - 6t \Rightarrow a(2) = 12$

a) 6 in/min²
b) 12 in/min
→ c) 12 in/min²
d) −12 in/min²

8. f continuous on $[-3, 6]$; $f(-3) = -1$, $f(6) = 3$.

IVT guarantees: D $f(c) = 1$ for at least one c b/w -3 & 6.